ESSAYS ON DIRECT FOREIGN INVESTMENT IN UNIONIZED MARKETS

By

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The dissertation is a collection of three essays, analyzing various patterns of direct foreign investment (DFI) in the framework of endogenous protection and unionized labor markets. Chapter 2 develops a model of endogenous protection with DFI in a 3-stage-3-player game framework. A domestic labor union lobbies against foreign imports and bargains over wages with a domestic firm and a foreign multinational. When import protection depends on the union's lobbying, more DFI results in higher lobbying efforts and lower imports. However, if DFI defuses directly the effectiveness of union lobbying due to political economy considerations (quid pro quo DFI), then more DFI could decrease the level of lobbying and increase imports allowed.

Chapter 3 builds a model of international joint ventures (JV) with political economy considerations as the main motivation, based on the insight of quid pro quo

DFI. A domestic firm and a union both lobby against foreign imports, while the foreign firm decides whether to undertake full ownership DFI, or to form a JV with the domestic firm, or to do nothing at all. It is shown that in the absence of political economy considerations, a JV is never formed; in the presence of political economy considerations, the formation of a JV is the unique equilibrium.

Chapter 4 constructs a model of intra-industry cross-hauling DFI, where wages and employment are determined through simultaneous efficient Nash bargaining games between the multinational firms and national unions. Three different equilibria of DFI are studied: a). no DFI by either firm, b). one way DFI, c). cross-hauling DFI. It is shown that under the conditions given, cross-hauling DFI is the unique Nash equilibrium, with which the negotiated wage decreases, firm profit increases, union rent decreases. Employment increases (decreases), national welfare increases (decreases) if the union is wage (employment) oriented.

CHAPTER 1
POLITICAL-ECONOMY DETERMINANTS OF DIRECT FOREIGN INVESTMENT

According to traditional theories of international trade, in the Heckscher-Ohlin setup, for example, capital movements are seen largely as a substitute to commodity trade. In the presence of impediments to international trade, e.g. commercial policy, transportation costs, etc., differentials to capital return are created across countries. Direct foreign investment (DFI) is induced to flow from the country in which capital is the relatively abundant factor (with a low return) to the country in which capital is the relatively scare factor (with a high return). Thus, DFI is simply a form of international capital movement seeking higher return, even though portfolio investment can achieve the same purpose.

A second approach to DFI emerged from industrial organization theory.[1] It is said that firm-specific advantages such as intangible assets drive DFI. These intangible assets exist in the form of organizational or marketing skills (know-how), production or processing technologies (patents). The firm-specific advantages enable multinational firms (MNF) to overcome the extra costs of managing geographically widespread operations in different cultural and political backgrounds. DFI is chosen over alternative modes of doing business (e.g. exporting or licensing) because DFI encounters the lowest 'transaction cost' of contract enforcement and maintenance of quality. With exporting or licensing, the market fails to award the firm adequate returns due to the public-goods nature of intangible assets, shirking of the licensee and uncertainty in the quality of the goods; with DFI, the firm can internalize the market inefficiencies. According to this approach, DFI occurs most often in industries where research and development are most active or intermediate goods are heavily used.

Attempts have been made to extend the industrial organization approach to DFI to explain the formation of international joint ventures[2] (JV). It is argued that the formation of JVs puts partners in a mutual hostage situation, which mitigates the incentives to shirk. A JV bypasses inefficient intermediate markets and avoids the loss due to tacit knowledge transfer. Thus, JVs are commonly seen in industries where tacit knowledge and intermediate inputs are transferred. It is not clear why the firm does not 'internalize' all the way and create wholly owned subsidiaries.

The above approaches almost completely ignore the roles of political economy and interest groups such as labor unions. Even though the two approaches mention tariffs as impediments to international trade which may facilitate DFI, trade restrictions are treated as exogenously given. Such DFI is merely a passive reaction of the exporting country to evade trade restrictions. However, international economists commonly believe that trade barriers are a result of the domestic political process, where different interest groups lobby to influence the government and determine the content of protection. The exporting country may undertake DFI to influence the attitudes and efforts of the interest groups in the host country. By abstracting from political economy considerations, the above approaches can not explain a considerable portion of DFI either in the form of wholly owned subsidiaries or JVs.

A second factor that may have significance in determining the pattern of DFI is the role labor unions play. Unionized markets are a common phenomenon in many countries. Labor unions usually seek higher wages and higher employment for members. They are very active in influencing legislation, agricultural policy, industrial policy and commercial policy. To the national labor unions, capital mobility across borders means the prospect of job losses and the deterioration of bargaining positions. Thus they do not welcome DFI, be it inward or outward. By abstracting from modeling the role of labor unions, the above approaches miss the ongoing debate that while unions often blame MNFs for shifting jobs overseas, MNFs argue that high labor cost is the exact reason they do so.

It is said that the first half of this century is marked by traditional one-way DFI, while the second half witnesses more common mutually penetrating two-way DFI. Under the assumptions of the above approaches, mutually penetrating DFI can not occur within the same sector. Thus the phenomenon of intra-industry cross-hauling DFI still remains to be explained.

Incorporating political-economy considerations and unionized markets in modeling the pattern of DFI is the task of this dissertation. In the early 1970s, trade theorists began to bring the political processes explicitly into the analysis of economic phenomena and policy. Among the pioneers are Krueger (1974) and Bhagwati (1982), who analyzed the rent-seeking and directly unproductive profit-seeking (DUP) activities; Brock and Magee (1978, 1980), Findlay and Wellisz (1982), Baldwin (1976, 1982) and Mayer (1984) who suggested alternative models for studying the economic and political forms that interact in determining a country's tariff structure.

While the above papers all focus on the commodity markets, it was Bhagwati (1985) who first introduced political economy in the factor markets, which results in what he called 'quid pro quo' DFI. Quid pro quo DFI occurs when the foreign firm invests in period one with a loss, but with a view to defusing the threat of protection against its exports in future periods, thereby maximizing discounted total profits. Quid pro quo DFI distinguishes itself from the traditional tariff-jumping DFI in that with the former, the investing country anticipates the threat of future trade restrictions and invests in order to influence the attitudes of the interest groups in the host country, hoping to reduce future restrictions; while with the latter, the investing country only acts passively to evade the exogenously given tariffs.

The formal analysis of quid pro quo DFI began with Bhagwati et al. (1987), who used the standard 2x2x2 model of international trade theory to analyze the exporting country's optimal intervention policy. Dinopoulos and Bhagwati (1986) analyzed industry-specific quid pro quo DFI in the context of different industry structures. Wong (1989) and Dinopoulos and Wong (1991) endogenized the threat of future protection by a labor union which lobbies in order to eliminate unemployment and analyzed various government interventions in both the exporting and importing countries. Dinopoulos (1992) studied industry--specific quid pro quo DFI by modeling the lobbying process as a Nash bargaining game between the government and the labor union.

Chapter 2 of the dissertation generalizes the analysis of Wong (1989), Dinopoulos and Wong (1991) and Dinopoulos (1992). It develops a model of endogenous protection in the presence of direct foreign investment in a 3-stage-3-player game framework. A domestic labor union interested in both employment and wages lobbies against foreign imports and bargains over wages with a domestic firm and a foreign multinational. The conventional belief is that labor unions welcome DFI because it creates jobs. By endogenizing import restriction, the wage rate and employment, I show that when import protection depends on the union's resource-using lobbying, more DFI increases the marginal benefit of lobbying and leaves the marginal cost of lobbying unchanged, and hence more DFI always results in higher lobbying efforts and lower imports. However, if DFI defuses directly the effectiveness of union lobbying due to political economy considerations (quid pro quo DFI), then more DFI could decrease the level of lobbying and increase imports allowed. This chapter demonstrates clearly the impact of political economy considerations on endogenous protection.

Chapter 3 builds a model of international JVs with political-economy considerations as the main motivation, based on the insight of quid pro quo DFI. A domestic firm and a union both lobby against foreign imports, while the foreign firm decides whether to undertake full ownership DFI, or to form a JV with the domestic firm, or to do nothing at all. The paper shows that in the absence of the so called 'quid pro quo' political-economy considerations, a JV is never formed with endogenous lobbying; in the presence of such political-economy considerations, the formation of a JV is the unique equilibrium. The labor union is indifferent between a wholly owned subsidiary and a JV, because they provide the same level of union employment. The home firm always prefers a JV to a wholly owned subsidiary with or without quid pro quo political-economy considerations.

Very few papers have modeled intra-industry cross-hauling DFI. The conventional view is that DFI from a foreign country (inward) benefits workers, while DFI to a foreign country (outward) hurts workers. But in reality, labor unions are often hostile toward both types of DFI. The reason is that when a firm becomes a multinational, employment stability for labor is reduced and strikes by unions only affect portions of the firm's earnings, in contrast to the total earnings when it operates solely in a single country. This phenomenon can only be explained in the context of two-way cross-hauling DFI.

Jones et al. (1983) provide a general equilibrium, perfect competition model of cross-hauling DFI. They assume that capital is sector-specific but internationally mobile. When demand in the nontraded goods sector increases, capital has to be imported from overseas into this sector, while capital has to be exported in the traded-goods sector. Dinopoulos (1986) also studies cross-hauling DFI in a model of trade in similar products. Cross-hauling DFI occurs because different national tastes interact, which provides incentives for mutual exchange of the activity-specific resources across firms in different countries. These papers assume away the role of labor unions and generate cross-hauling DFI in two different sectors, rather than within the same sector.

Chapter 4 of the dissertation constructs a model of intra-industry cross-hauling DFI with unionized oligopoly, where the wage rate and the level of employment are determined through simultaneous, efficient Nash bargaining games between the multinational firms and national labor unions. It captures the phenomenon that while General Motors has subsidiaries in Europe, BMW also produces in the U.S. Three different equilibria of DFI are studied in the presence of unionized markets: a). no DFI by either firm, b). one way DFI, c). intra-industry cross-hauling DFI. It is shown that under identical technologies across countries, if the sunk cost of DFI is sufficiently small, then cross-hauling DFI is the unique Nash equilibrium. With cross-hauling DFI, the negotiated wage rate decreases, firm profit increases, union rent decreases, the level of employment increases (decreases) if the union is wage (employment) oriented, and national welfare increases (decreases) if the union is wage (employment) oriented.

Notes

1. Hymer's (1976) seminal work was the first to suggest this approach. For a detailed survey of the literature, see Caves (1981).

2. See, for example, Hennart (1988) and Kugot (1988).

CHAPTER 2
ENDOGENOUS PROTECTION AND DIRECT FOREIGN INVESTMENT

2.1 Introduction

Since Bhagwati (1985) introduced the concept of quid pro quo direct foreign investment (DFI), it has attracted considerable interest in the literature. Quid pro quo DFI, as Bhagwati called it, occurs when "the foreign firm invests in period 1 . . . with a view to influencing favorably the threat of protection in period 2 later and thereby making more profits by keeping markets open. Thus, the aim of such DFI is to defuse the protectionist threat (Bhagwati, 1987:2)."

In the literature on this topic (e.g. Bhagwati (1987), Bhagwati, Brecher, Dinopoulos and Srinivasan (1987), Dinopoulos (1989, 1992), Wong (1989) and Bhagwati, Dinopoulos and Wong (1992)),[1] it is described that quid pro quo DFI could display itself in three ways: 1). DFI can be used to "coopt" the legislative and executive branches in democratic countries into a less protectionist stance and actions; 2). DFI can reduce corporate pressures for protection if it takes the form of a joint venture; 3). it can also reduce union pressures for protection by creating more jobs.

Chapter 2 develops a two-period model of industry-specific DFI with two profit maximizing firms (one domestic and the other a foreign multinational) and one domestic labor union interacting in the home country. The analysis combines two distinct approaches to the theory of endogenous protection: the resource-using lobbying approach (see Findlay and Wellisz, 1982) and the exogenously given political-economy considerations (quid pro quo DFI) approach. The model has two contrasting features: 1). DFI and endogenous import restrictions are complementary to each other with resource-using lobbying against foreign imports. Thus even in the presence of endogenous trade restrictions, DFI does not occur. This runs counter to the conventional 'tariff-jumping' or 'tariff-induced' DFI hypothesis, where the foreign firm undertakes DFI to evade trade restrictions in the general form of tariffs and quotas (see for example, Caves, 1992 and Balasubramanyam and Salisu, 1991). 2). DFI could reduce future restrictions against foreign imports with quid pro quo DFI. And we identify under what conditions quid pro quo DFI emerges. The model clearly demonstrates the impact of quid pro quo political-economy considerations on endogenous import restriction. The results seem to confirm that the above mentioned distinct approaches to endogenous protection reenforce each other.

In order to compare results, I follow the conventional quid pro quo DFI structure and assume that the foreign firm acts as a Stackelberg leader in choosing DFI fixed for two periods. In the first period, trade remains free and the foreign firm determines the level of exports into the home country by maximizing profits. The labor union lobbies the home government for protection against foreign imports, while simultaneously the domestic firm maximizes profits by choosing output. Then the labor union bargains with the two firms over wages. In the second period, trade is restricted in accordance with the level of first period labor lobbying.

The first result shows that DFI and endogenous import restrictions are complements. If import restrictions depend only on the resource-using lobbying by the labor union, then an increase in DFI raises the union's marginal benefit of lobbying but leaves its marginal cost of lobbying unchanged. Consequently more DFI always results in higher lobbying efforts from the union and hence lower imports. This result arises even if DFI increases employment and thus benefits the union.

The second result shows that the complementarity relationship between DFI and import restrictions can be reversed if quid pro quo political-economy considerations are added to the model. That is, if DFI changes directly the lobbying effectiveness of the union by making lobbying more costly, then the present model could generate quid-pro-quo DFI. In other words, more DFI could increase the level of imports allowed in the form of Voluntary Export Restraint (VER) imposed against the foreign firm.

Wong (1989) and Dinopoulos and Wong (1991) model a union which lobbies to eliminate industry-specific unemployment and maximize net lobbying benefits, but they assume perfect competition and have the wage rate fixed at the competitive level, so that union lobbying increases only employment. In Dinopoulos (1992), the labor union bargains with the domestic government for the level of import restriction, and the author abstracts from incorporating resource-using lobbying.

In the present model I assume that labor lobbying instead of bargaining determines the level of import restrictions. By introducing a domestic firm and resource-using lobbying into the model and endogenizing the wage rate and the level of employment, I generalize the analysis of Wong (1989) and Dinopoulos (1992). I also analyze the effects of domestic lobbying pressure on DFI, as well as the effects of DFI on wages, prices, union utility and profits of the two competing firms.

Section 2.2 develops the basic model. Section 2.3 generates conventional quid pro quo DFI. Section 2.4 determines the optimal level of DFI for the foreign firm. Section 2.5 concludes.

2.2 A Three-Stage Bargaining Model with Lobbying

There are three economic agents in the industry: a foreign firm which can produce in both the foreign country and the host country but sells only in the host country; a domestic firm which produces and sells only in the home country; and a labor union whose members are employed by the domestic firm as well as by the foreign subsidiary in the host country. The host country government sets the level of import restrictions (a VER imposed on the foreign firm) in response to the lobbying pressure of the labor union. As lobbying pressure increases, import restrictions become more strict; i.e., the level of imports permitted under the VER becomes lower.

I assume that in the home country, output is produced with labor alone with constant returns to scale and an input-output coefficient equal to one by choice of units. Hence output is equal to the level of employment. In the foreign country, the foreign firm has decreasing marginal cost of production. Transportation cost is zero. Thus in the absence of trade restrictions, the foreign firm produces in its own country and exports abroad. The host country firm never produces in the foreign country. As a result, DFI does not occur if free trade prevails. The foreign firm undertakes DFI only if the host country imposes restrictions against imports. I shall argue that in our model (with endogenous protection) such 'tariff-jumping' DFI only hurts the foreign firm. However, with quid pro quo DFI, the foreign multinational's total profits from DFI and exports could increase.

In order to compare results with the quid pro quo DFI literature, I assume the same bargaining sequence as in Dinopoulos (1992) as we follow Bhagwati et al. (1987) by assuming that DFI by the exporting country will reduce future protection being invoked against the exporting country. The strategic moves in this three-stage game are as follows:

Period I 1. The foreign firm determines DFI, which remains fixed for two periods,
2. The labor union lobbies for import restrictions and the domestic firm chooses output to maximize profits,
3. The labor union and the two firms bargain over the wage rate;
Period II 4. Import restrictions are imposed as a result of lobbying,
5. The domestic firm chooses output,
6. The labor union and the two firms bargain over the wage rate.

First, realizing the possible Stackelberg leader position in the game, the foreign firm chooses the level of DFI which remains fixed for two periods. Of course, when doing this, the foreign firm takes into account the protectionist pressure in the host country. Then given the level of DFI by the foreign firm, the labor union lobbies for import protection (the level of VER) and simultaneously the domestic firm maximizes profits by choosing the optimal level of output.[2] Finally the union and the two firms bargain over the wage rate. The first period includes the above 3 stages. In the second period, only the last 2 stages are repeated. To ensure subgame perfectness, the game is solved backwards.

Before I introduce the notation of the model a couple of remarks concerning the assumed bargaining sequence are in order. The assumption that DFI is equivalent to output imposes a natural bargaining sequence. Since we would like DFI to be determined before the political process takes place (to compare results with the quid pro quo DFI literature), output is determined before the wage rate is negotiated. Adopting the efficient bargaining framework introduced by McDonald and Solow (1981) would result in simultaneous determination of output and the wage rate, which would exclude the possibility that DFI is determined in the beginning of the first period. In addition, the Brander and Spencer (1988) bargaining game which assumes that the wage rate is negotiated first and then the firm determines the output unilaterally is not appropriate in our framework because it would imply that decisions to invest in a foreign country were more flexible than wage contracts. Consequently, the context of quid pro quo DFI gives rise to a game where wages are negotiated after the determination of DFI which in turn determines output and employment.

I should also note that throughout the dissertation, a VER instead of other trade restraints such as a tariff or a quota is adopted, because the imposition of VERs is a very common practice in the industries I am interested in, particularly the automobile industry. VERs differ from tariffs and quotas in that they are imposed by the exporting countries rather by the importing countries, and thus are perceived as being in less conflict with the GATT. Adopting a tariff or a quota would not change the qualitative results of this dissertation.

The following notation will be used throughout this chapter.

X = level of DFI by the foreign firm

Y = level of imports, and VER in the second period

Z = domestic firm production

L = level of union lobbying

C = cost of lobbying

Π = profits of the domestic firm

Π^* = profits of the foreign multinational

U = union utility

W = negotiated wage rate

$\bar{W}$ = wage rate in the nonunionized outside goods sectors

P = inverse demand

Subscripts denote partial derivatives.

I model the objective of the union by assuming that it maximizes a general concave utility function.[3] Specifically we use the Stone-Geary functional form:

$$U = (W-\bar{W})^{\theta}(N-\bar{N})^{\gamma}$$

where W is the wage rate, N union employment. $\bar{W}$ and $\bar{N}$ can be thought of as "minimum" or "reference" levels of wages and employment. The parameters θ and γ capture the relative importance of wage differentials and employment to the labor union. According to Pemberton (1988), this utility function can also be thought of as a Nash bargaining product between the union membership and leadership, with the former emphasizing wage differentials and the latter union membership (size).

Adopting the Stone-Geary utility functional form, the lobbying union's utility can be expressed as a function of wage differentials, the level of employment and lobbying effort. Formally,

$$U = (W-\bar{W})^{\theta}(X+Z)^{\gamma}[C(L)]^{-\delta} \tag{2.1}$$

where C(L) represents the cost of supplying lobbying effort L. Notice that the union's utility is log-separable in the wage rate, the level of employment and the lobbying effort. L is a productive input (for protection) with direct disutility for the union. This formulation where cost is introduced in the utility function is standard in the principal-agent literature (see Holmstrom, 1979). We assume $\delta > 0$, $C' > 0$, $C'' > 0$ and U(.) is concave[4] in its arguments. One could express the objective of the union as maximizing expression (2.1) for $\delta = 0$, net of discounted lobbying costs (see Wong, 1989). By introducing the lobbying effort into the union's utility, the analysis is simplified. θ,γ correspond respectively to the wage and employment elasticity of the union's utility. It is obvious that $\theta,\gamma \in [0,1]$ from Pemberton (1988). If $\theta>\gamma$, then the union is called wage-oriented and if $\gamma>\theta$, then the union is called employment-oriented (Mezzetti and Dinopoulos, 1991). An increase in lobbying effort increases the cost of lobbying and reduces the level of the union's utility, ceteris paribus.

Profits of the foreign subsidiary and the domestic firm respectively are[5]

$$\Pi^{X}(X,Y,Z,W) = (P-W)X \tag{2.2a}$$

$$\Pi(X,Y,Z,W) = (P-W)Z \tag{2.2b}$$

where $P = P(X+Y+Z)$ is the inverse demand, with $P' < 0$ and $P'' < 0$.

The foreign firm's profit from exporting to the host country is

$$\Pi^Y(X,Y,Z,W) = PY - T(Y) \tag{2.2c}$$

where $T(Y)$ is the cost of production in the foreign country with $T' \epsilon (0,1)$ to represent increasing returns to scale. This implies that in the absence of trade restrictions, DFI does not occur since the marginal cost of production is smaller in the foreign country.

The total profits of the multinational include the profits from the subsidiary and exports:

$$\Pi^* = \Pi^X + \Pi^Y \tag{2.3}$$

where Π^X, Π^Y are given in (2.2a) and (2.2c).

2.2.1 The Determination of the Wage Rate

In the last stage of the game the union and the two firms determine the wage rate through a noncooperative Cournot-Nash bargaining game, taking X, Y, Z and L as given. The Nash bargaining solution is obtained by maximizing the "Generalized Nash Product," which is a product of the payoff functions for the three players, net of opportunity costs as measured from the threat points.

Assume that the firms have zero opportunity costs (i.e. firms' alternative is normal profits) and that in case of disagreement during bargaining the union strikes. Therefore employment X and Z become zero and the alternative utility of the union and the profit of the domestic firm take zero values. The foreign multinational still produces in the foreign country. Its conflict payoff is the profit from exporting into the home country. With free trade, the multinational can choose the level of exports to maximize profits and its conflict payoff is

$$\bar{\Pi}(Y^*) = \bar{P}(Y^*)Y^* - T(Y^*) \tag{2.4a}$$

where Y^* is the optimal level of export and $\bar{P}$ is a function of Y^* only, since $X = Z = 0$ when the union strikes. With trade restrictions in the second period, the multinational's conflict payoff is

$$\bar{\Pi}(\hat{Y}) = \bar{P}(\hat{Y})\hat{Y} - T(\hat{Y}) \tag{2.4b}$$

where $\hat{Y}$ is the optimal level of VER imposed by the home government in response to union lobbying, and $\bar{P}$ is a function of $\hat{Y}$ only when the union strikes. Please observe that the multinational's conflict payoffs are constants corresponding to the optimal levels of exports and the VER respectively.

With the above descriptions of the bargaining game, the generalized Nash bargaining product is

$$F(X,Y,Z,L,W) = U^{\alpha}\,\Pi^{\beta}\,(\,\Pi^* - \bar{\Pi})^{1-\alpha-\beta} \tag{2.5}$$

where α and β are the relative bargaining weights of the union and the domestic firm.

Substituting (2.1), (2.2), (2.3) and (2.4) into (2.5) yields

$$G = [(W-\bar{W})^{\theta}(X+Z)^{\gamma}C(L)^{-\delta}]^{\alpha}\,[(P-W)Z]^{\beta}\,[(P-W)X+PY-T(Y)-\bar{\Pi}]^{1-\alpha-\beta} \tag{2.6}$$

where $\bar{\Pi}$ is replaced by (2.4a) in the first-period bargaining and by (2.4b) in the second-period bargaining. Maximizing G(.) with respect to the wage rate W, the first order condition is obtained as follows:

$$\frac{\alpha\theta G}{W-\bar{W}} - \frac{\beta G}{P-W} - \frac{(1-\alpha-\beta)XG}{(P-W)X+PY-T(Y)-\bar{\Pi}} = 0 \tag{2.7}$$

The first term on the left hand side of (2.7) is the gains for the union and the last two terms the losses to the firms as the negotiated wage rate increases.

From condition (2.7) one gets the negotiated wage rate implicitly as a function P, X, L and the parameters $\bar{W}, \alpha, \beta, \theta$ and $\bar{\Pi}$. Since P = P(X+Y+Z) and Y in turn is a function of L (see next section for the formation of Y), the negotiated wage rate can be written as a function of X, Z, L and the parameters, such that

$$W = W(X,Z,L,\bar{W},\alpha,\beta,\theta,\bar{\Pi}) \tag{2.8}$$

Total differentiation of condition (2.7) yields

$$\partial W/\partial X < 0,\ \partial W/\partial Z < 0,\ \partial W/\partial L > 0,\ \partial W/\partial P \in (0,1),\ \partial^2 W/\partial P^2 < 0.$$

As far as the parameters are concerned, one has

$$dW/d\bar{W} > 0,\ dW/d\alpha > 0,\ dW/d\theta > 0,\ dW/d\beta < 0,\ dW/d\bar{\Pi} < 0.$$

The intuition is, the negotiated wage rate increases if the competitive wage, or the union's relative bargaining weight, or its preferences toward wage differentials increase; it decreases if the firms' relative bargaining weights increase, or the foreign multinational's conflict payoff increases.

2.2.2 Lobbying and Protection

In the second stage of the game the labor union lobbies the government for import protection, while the domestic firm chooses output to maximize profits, taking as given the level of DFI, X. As a result of union lobbying, the level of protection is determined. Here we assume that the import restriction (VER) is a function of total union lobbying,[6] i.e. Y = Y(L), with Y' < 0, and Y" > 0, implying positive marginal product and increasing marginal cost.

I look at the domestic firm's profit first. Substituting the negotiated wage rate (2.8) into (2.2b) yields

$$\Pi = (P - W(X,Z,L))Z \tag{2.9}$$

The impact of imports and union lobbying on the domestic firm's profit respectively is

$$\Pi_Y = (1-\frac{\partial W}{\partial P})ZP' < 0 \tag{2.10a}$$

$$\Pi_L = (1-\frac{\partial W}{\partial P})ZP'Y' > 0 \tag{2.10b}$$

Condition (2.10a) implies that for a given output, more imports reduce domestic price and hence the firm's profits. Condition (2.10b) implies that union lobbying reduces imports and in turn increases domestic price and the firm's profits.

Maximizing (2.9) with respect to Z yields the following first order condition

$$\Pi_Z = P - W + (1-\frac{\partial W}{\partial P})ZP' = 0 \tag{2.11}$$

Condition (2.11) implicitly defines the optimal level of output, which is obtained when the firm equals marginal revenue to marginal cost.

The impact of DFI on the domestic firm's profit is

$$\Pi_X = (1-\frac{\partial W}{\partial P})ZP' + (P-w)\frac{dZ}{dX} < 0 \tag{2.12}$$

where the first term is the loss from reduced domestic price, the second term is the loss from reduced output, both due to more DFI. The sign of dZ/dX is negative, obtained from total differentiation of condition (2.11).

I now turn to the analysis of the labor union's behavior. Substituting the negotiated wage rate (2.8) into the union's utility function, we can express the latter as a function of employment and lobbying efforts, i.e.

$$U(X,Z,L) = (W(X,Z,L)-\bar{W})^{\theta}(X+Z)^{\gamma}[C(L)]^{-\delta} \tag{2.13}$$

The derivative of (2.13) with respect to imports is

$$U_Y = \frac{\theta U P'}{W-\bar{W}}\frac{\partial W}{\partial P} < 0 \tag{2.14}$$

Condition (2.14) implies that for a given level of employment, more imports reduce the union's utility through the reduction of the domestic price and consequently the negotiated wage rate.

The effect of DFI on the union's utility for any given level of imports and lobbying is

$$U_X = \frac{\theta U P'}{W-\bar{W}}\frac{\partial W}{\partial P} + \frac{\gamma U}{X+Z} \tag{2.15}$$

Expression (2.15) includes two effects. The first term on the right hand side (RHS) captures the wage effect: given the level of imports, more DFI reduces the domestic price and in turn the negotiated wage rate and the utility of the union; the second term shows the employment effect: an increase in DFI increases the utility of the union by creating more jobs, ceteris paribus. The sign of the total effects is ambiguous. But if the second term dominates the first, then expression (2.15) is positive, i.e., more DFI is desirable for the union. Following the quid pro quo DFI literature, we assume that this condition holds true for the rest of the analysis unless otherwise stated.

I now analyze the determination of the union's optimal lobbying and the level of import restriction. Maximizing (2.13) with respect to L yields

$$U_L = \frac{\theta P'Y'U}{W-\bar{W}}\frac{\partial W}{\partial P} - \frac{\delta C'U}{C} = 0 \tag{2.16}$$

The first term of (2.16) between the equal signs is the marginal benefit of lobbying, the second term the marginal cost. Marginal benefit of lobbying is positive because lobbying reduces imports which increases domestic price and this in turn increases the negotiated wage rate. This is the wage effect of lobbying. Condition (2.16) does not have an employment effect of lobbying. This arises because of the simultaneous determination of L and Z; L does not affect Z directly and thus dZ/dL = 0. The union maximizes its utility when marginal benefit of lobbying equals marginal cost. Condition (2.16) implicitly defines the optimal level of union lobbying, L^*.

To characterize the optimal level of union lobbying more clearly, define

$$MB(L) = \frac{\theta P'Y'}{W-\bar{W}}\frac{\partial W}{\partial P} \qquad (2.17a)$$

$$MC(L) = \frac{\delta C'}{C} \qquad (2.17b)$$

where MB(L) and MC(L) correspond respectively to the marginal benefit and marginal cost of lobbying to the labor union. Differentiating MB(L) and MC(L) with respect to the union's lobbying, L, yields

$$\frac{\partial MB}{\partial L} = \frac{\theta}{W-\bar{W}}\{[P''(Y')^2+P'Y'']\frac{\partial W}{\partial P} + [\frac{\partial^2 W}{\partial P^2} - \frac{1}{W-\bar{W}}(\frac{\partial W}{\partial P})^2](P'Y')^2\} \qquad (2.18a)$$

$$\frac{\partial MC}{\partial L} = \frac{-\delta(C')^2+\delta CC''}{C^2} \qquad (2.18b)$$

Conditions (2.18a) and (2.18b) provide the slopes respectively for the marginal benefit curve and the marginal cost curve of lobbying. The sign of (2.18a) is negative, while that of (2.18b) is positive if we rule out increasing returns to lobbying.

I can show marginal benefit and marginal cost of lobbying for the union as in figure 2.1. The intersection of the two curves determines the optimal level of lobbying the union undertakes, L^*, and hence the VER the foreign firm has to face, $\hat{Y}$ in the second period.

Next, I analyze the impact of DFI on the marginal benefit and marginal cost of lobbying. Differentiating the marginal benefit and marginal cost of union lobbying with respect to DFI yields

$$\frac{\partial MB}{\partial X} = \frac{\theta Y'}{W-\bar{W}}\{[\frac{\partial^2 W}{\partial P^2}(P')^2+\frac{\partial W}{\partial P}P''] - \frac{1}{W-\bar{W}}(\frac{\partial W}{\partial P}P')^2\}(1+\frac{dZ}{dX}) \tag{2.19a}$$

$$\frac{\partial MC}{\partial X} = 0 \tag{2.19b}$$

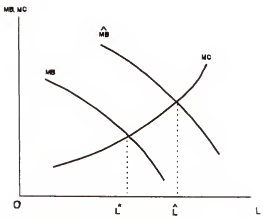

Figure 2.1 Optimal lobbying, DFI increases lobbying

Condition (2.19a) is positively signed. It implies that an increase in DFI increases the marginal benefit of union lobbying, since more DFI increases domestic employment; on the other hand, condition (2.19b) states that an increase in DFI leaves the marginal cost of union lobbying unchanged. As a result, the level of optimal union lobbying increases. This is shown in figure 2.1, where curve MB shifts up to $\hat{MB}$, but curve MC does not shift. The optimal level of union lobbying is $\hat{L}$, with $\hat{L} > L^*$.

The above analysis establishes the endogenous relation between union lobbying and foreign DFI: more DFI increases the level of union lobbying, i.e. $dL/dX > 0$. Since Y'(L) < 0, I thus have $dY/dX < 0$, that is, DFI and endogenous import restrictions are complements in that an increase in DFI lowers the level of imports allowed. These results distinguish this chapter from Dinopoulos and Wong (1991), who treat the wage rate as fixed and consider only the employment effect. Their conclusion is that DFI decreases the level of import restrictions.

2.3 Lobbying and Quid Pro Quo DFI

Quid pro quo DFI can readily be generated from the present model. In this section, I introduce quid pro quo political-economy considerations into the lobbying cost function of the labor union. Assume the host country government believes that DFI creates jobs and hence benefit workers at home. Then any increase of DFI will make policy makers more reluctant to establish import restrictions (called quid pro quo DFI by Bhagwati, 1985). Therefore more DFI reduces the effectiveness of lobbying in terms of the VER for any given lobbying effort.

With quid pro quo political-economy considerations, the union's lobbying cost actually becomes

$$C = C(L,X) \tag{2.20}$$

with $C_L > 0,\ C_{LL} > 0,\ C_X > 0$ and $C_{XX} < 0$, thus the cost of lobbying increases in DFI.[7] We also assume $C_{LX} > 0$, which implies that the marginal cost of lobbying increases with more DFI.

The union's new utility function can be written as

$$U(X,Z,L) = (W(X,Z,L)-\bar{W})^{\theta}(X+Z)^{\gamma}[C(L,X)]^{-\delta} \tag{2.21}$$

The effect of an increase of DFI on the union's utility is

$$U_X = \frac{\theta U P'}{W-\bar{W}}\frac{\partial W}{\partial P} + \frac{\gamma U}{X+Z} - \frac{\delta C_X U}{C} \tag{2.22}$$

Notice the difference between conditions (2.22) and (2.15). In (2.15), C = C(L) and $C_X = 0$; in (2.22), C = C(L, X) and $C_X > 0$. Thus U_X in (2.22) is much smaller than in (2.15), which implies that with $C_X > 0$, DFI becomes less desirable to the labor union.

I still have $\partial MB/\partial L < 0$, $\partial MC/\partial L > 0$ and $\partial MB/\partial X > 0$ as in Section 2.2. However, to complicate things, the sign of $\partial MC/\partial X$ becomes ambiguous here.

$$\frac{\partial MC}{\partial X} = \frac{\delta}{C^2}(CC_{XL} - C_L C_X) \tag{2.23}$$

The point of concern is, if CC_{XL} outweighs $C_L C_X$, one obtains $\frac{\partial C_L}{\partial X}\frac{X}{C_L} > \frac{\partial C}{\partial X}\frac{X}{C}$, i.e. the elasticity of marginal lobbying cost with respect to DFI is greater than the elasticity of lobbying cost with respect to DFI, then expression (2.23) is positively signed. As shown in figure 2.2, if $\partial MC/\partial X$ becomes very big, then the marginal cost curve shifts upward considerably. When the upward shift of the marginal cost curve MC(L) is bigger than the upward shift of the marginal benefit curve MB(L), then the union's optimal level of lobbying decreases from L^* to L^o .

From the above analysis, it can be seen that by adding quid pro quo political-economy considerations, the domestic protectionist pressure can be reduced by increases in DFI. The reason is: an increase in DFI dampens the union's lobbying efforts because of increased lobbying costs and consequently more imports will enter in future periods.

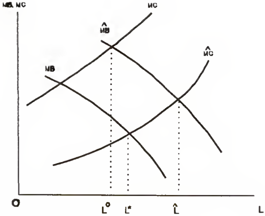

Figure 2.2 Quid pro quo DFI

2.4 The Determination of Optimal DFI

In sections 2.2 and 2.3, I have solved the last two stages of the game and determined the negotiated wage rate, the domestic output, the optimal levels of lobbying from the labor union and hence the import protection (VER). Now I turn to the first stage of the game, in which the foreign multinational maximizes its discounted two-period profits by choosing the optimal level of DFI for two periods and the optimal level of exports in the first period. I consider two cases: with and without quid pro quo political-economy considerations.

When the labor union lobbies, it has to go through different channels to influence the government and that takes time. I assume that in period 1 trade remains free and in period 2 there is a VER imposed on the foreign firm.

I look at the foreign multinational's second period profits first. Denote second period profits and variables with a hat(^), first period variables as usual, then

$$\hat{\Pi}^* = (P-W)\hat{X} + P\hat{Y} - T(\hat{Y}) \tag{2.24}$$

where $\hat{Y}$ is the VER, $\hat{X}$ is the second period DFI determined in the first period and $T(\hat{Y})$ is the cost of production in the foreign country with $T' \in (0, 1)$. Note that in the absence of trade restrictions, DFI does not occur since the marginal cost of production is smaller in the foreign country. Besides quid pro quo political-economy considerations, the only reason the foreign firm undertakes DFI is to evade the VER. The first order condition of (2.24) determines the optimal level of second period DFI for a given level of second period VER:

$$\hat{\Pi}^*_{\hat{X}} = (P-W) + (1-\frac{\partial W}{\partial P})\hat{X}P' + \hat{Y}P' = 0 \tag{2.25}$$

Condition (2.25) implicitly defines the optimal second period DFI $\hat{X}$ as a function of second period VER which in turn depends on DFI and the union lobbying in the first period. Hence

$$\hat{\Pi}^* = \hat{\Pi}^*(\hat{X}(\hat{Y}(X,L)),\hat{Y}(X,L)) \tag{2.26}$$

Differentiating (2.26) with respect to L yields

$$\begin{aligned} \frac{\partial\hat{\Pi}^*}{\partial L} &= \frac{\partial\hat{\Pi}^*}{\partial\hat{X}}\frac{\partial\hat{X}}{\partial\hat{Y}}\frac{\partial\hat{Y}}{\partial L} + \frac{\partial\hat{\Pi}^*}{\partial\hat{Y}}\frac{\partial\hat{Y}}{\partial L} \\ &= \frac{\partial\hat{\Pi}^*}{\partial\hat{Y}}\frac{\partial\hat{Y}}{\partial L} \end{aligned} \tag{2.27}$$

because (2.25) implies $\partial\hat{\Pi}^*/\partial\hat{X} = 0$.

To see the sign of expression (2.27), one needs to calculate the effects of $\hat{Y}$ on $\hat{\Pi}^*$ in (2.24). Since the foreign firm is producing at less than optimal level at home in the second period due to the VER, we have $\partial\hat{\Pi}^*/\partial\hat{Y}>0$; and from our VER function we have $\partial\hat{Y}/\partial L < 0$. Consequently the sign of expression (2.27) is negative; i.e., $\partial\hat{\Pi}^*/\partial L<0$. In other words, an increase in home lobbying reduces the foreign firm's second period profits.

Next, I derive the impact of DFI on the foreign multinational's second period profits.

In the absence of quid pro quo political-economy considerations, as shown in section 2.2, I have $dL/dX > 0$. Hence one obtains $\partial\hat{Y}/\partial X < 0$. As a result, I get

$$\frac{\partial\hat{\Pi}^*}{\partial X} = \frac{\partial\hat{\Pi}^*}{\partial\hat{Y}}\frac{\partial\hat{Y}}{\partial X} < 0 \tag{2.28}$$

Condition (2.28) is significant. It implies that an increase in first period DFI reduces second period profit for the foreign firm. Thus there exists a paradox: on the one hand, the very reason that the foreign firm undertakes DFI is that the existence of the VER lowers its profits; but on the other hand, engaging in DFI increases union lobbying and lowers the VER which in turn lowers the foreign firm's profits. As a result, in the absence of quid pro quo political-economy considerations, the optimal DFI for the foreign firm is zero.

With quid pro quo DFI, however, the above result is reversed. From section 2.3, $\partial L/\partial X < 0$, hence $\partial\hat{Y}/\partial X > 0$. Thus one obtains

$$\frac{\partial\hat{\Pi}^*}{\partial X} = \frac{\partial\hat{\Pi}^*}{\partial\hat{Y}}\frac{\partial\hat{Y}}{\partial X} > 0 \tag{2.29}$$

Condition (2.29) is in total contrast to condition (2.28). It states that with quid pro quo DFI, increases in first period DFI increase second period restricted profits. And if this increase in profits is big enough to offset the loss due to the inefficiency of DFI (higher marginal cost of production), then the foreign firm's total two period profits increase. As a result, the firm undertakes DFI purely due to political-economy considerations.

To solve the three-stage game, one needs to note that the discounted two period total profits for the foreign firm are

$$\Psi(X,Y) = (P-W)X + PY - T(Y) + \lambda\hat{\Pi}^* \tag{2.30}$$

where λ is the positive constant discount factor, and X and Y are first period DFI and imports. The firm maximizes (2.30) with respect to X and Y. Without quid pro quo political-economy considerations, since $\partial\hat{\Pi}^*/\partial X < 0$ and $\partial\Pi^*/\partial X < 0$, the optimal DFI is zero; with quid pro quo DFI, $\partial\hat{\Pi}^*/\partial X > 0$ but $\partial\Pi^*/\partial X < 0$. However, if $\partial\Psi/\partial X > 0$, which implies $\partial\hat{\Pi}^*/\partial X \geq -\frac{1}{\lambda}(\partial\Pi^*/\partial X)$, then quid pro quo DFI occurs.

2.5 Conclusions

By introducing lobbying efforts and hence lobbying costs into the labor union's Stone-Geary type utility function and by using a noncooperative Nash bargaining process to determine the wage rate, this chapter endogenizes employment, the wage rate, imports, DFI and the level of lobbying. In contrast to the conventional belief that more DFI reduces protectionist threats from the host country, it is shown that with resource-using lobbying by the labor union, domestic protectionist pressure increases as a result of DFI. Thus the optimal DFI for the foreign firm in the presence of endogenous import restriction is zero. However, if the lobbying of the union is made very costly with more DFI, due to quid pro quo DFI, then the union could be "coopted" to accept more foreign imports.

The model demonstrated clearly the impact of quid pro quo political-economy considerations on endogenous import protection. Without such political-economy considerations, even the conventional 'tariff-jumping' or 'tariff-induced' DFI results would not hold, since the foreign firm incurs a higher production cost if it undertakes DFI than producing in its own country and exporting.

The political economy approach to DFI, pioneered by Bhagwati (1985), has the potential to analyze a wide range of policy-making and decision-making processes. As stated in the introduction of this paper, 'quid pro quo joint venture' is an example. One could incorporate the domestic firm's lobbying against imports. This is possible because conditions (2.10) and (2.12) imply that more lobbying increases the domestic firm's profits while more DFI and imports do the opposite, ceteris paribus. Such a structure could permit the foreign firm to transfer new technology to the domestic firm and hence create 'quid pro quo joint ventures'. It is conceivable that the domestic firm's lobbying against imports can only be "defused" when its profit increases.

Notes

1. Bhagwati, Dinopoulos and Wong (1992) provide a very good review of the literature.

2. It is straight-forward to imagine similar lobbying from the domestic firm for protection. This addition does not change the qualitative nature of our main results. This is so because protection increases the utility of the union as well as profits of the domestic firm. In a subsequent study I found this to be true (see Chapter 3). Certainly one has to consider the possible free-riding in lobbying between the firm and the union. Since my main concern is to analyze the impact of DFI on lobbying, not free-riding on lobbying, I choose to avoid the complexity. The conclusion of the paper discusses this issue in more detail.

3. I can get the same results in this model if I use an alternative specification of the utility of the union, i.e. $U = nu(w)+(m-n)u(b)$, where u(.) is the concave utility function of an individual worker, m is the union membership, n is the level of union employment and b is the level of unemployment benefit. Oswald (1985) discusses the differences between the two specifications.

4. The general Stone-Geary utility function is concave in W and N. And as shown in expression (2.18b), as long as $\partial MC / \partial L > 0$, then $U_{LL} < 0$. Hence U(.) is concave in its arguments.

5. In principle, profits should incorporate the cost of capital explicitly, since DFI is not free. Then due to the assumption that the input-output coefficient is one, one has $\Pi = (P-W-R)Z$ and $\Pi^X = (P-W-R)X$, where R is the capital rental. Dinopoulos (1991) has shown that the analysis is robust to the introduction of capital costs.

6. See Findlay and Wellisz (1982) for a formulation of this process in general equilibrium where the level of protection (tariff in their case) depends on lobbying resources.

7. Alternatively the quid pro quo political economy impact of DFI on lobbying could be modelled as $Y = Y(L, X)$, with $Y_L < 0$, $Y_{LL} > 0$, $Y_X > 0$ and $Y_{XX} < 0$. Results are robust to what one gets under $C=C(L, X)$.

CHAPTER 3
ENDOGENOUS PROTECTION AND QUID PRO QUO JOINT VENTURES

3.1 Introduction

In the past decade, the economics of joint ventures has received a lot of attention. However, most studies are descriptive in nature with some prescriptive conclusions. Some more rigorous papers deal with the distribution of joint venture (JV) profits (see Svejnar and Smith, 1984 and Darrough and Stoughton, 1989), rather than with the formation of JVs. Moreover, when it comes to the motivations for JV formation, the literature dwells largely on risk sharing, technology transfer, the increase of market power and the reduction of transaction costs (see Berg and Friedman, 1977, 1980, Hennart, 1988 and Weston and Ornstein, 1984).

It seems that one important motive for JV formation has been ignored, that is, political economy. Numerous cases indicate that JVs involve political economy considerations. In many less developed countries, foreign firms can do business only when they form JVs with local firms. For example, in Kuwait, 'not even a branch of a foreign company can be established except through the use of a Kuwaiti agent' (Carter, 1988, p304); India, Malaysia, Mexico and Nigeria all have laws that limit the percentage of foreign ownership of local firms. On the other hand, foreign firms may benefit from host country government grants, subsidies, tax and export incentives if they form JVs with local firms.

In many situations, international JVs are used to ease 'political tensions' full ownership direct foreign investment (DFI) may cause. According to Harrigan (1985, p303), "to overcome disadvantages associated with local trade restrictions, outsiders often took local partners to acquire the image of being a national champion, even when they were not required to do so by local laws. For example, U.S. firms took local partners when they entered the Japanese markets in chemicals, pharmaceuticals, and cosmetics, as well as in precision controls(Harrigan, 1985, pp382-383)." It is also reported that the GM-Toyota JV formed in the U.S. in 1984 converted GM into an advocate of free trade while Chrysler and Ford lobbied for the renewal of the voluntary export restraint (VER) against Japan in 1985 (see Bhagwati et al., 1992). It seems that in many countries, full ownership DFI brings 'protectionism' or 'nationalism' with the image of 'us versus them', while the formation of international JVs can blur effectively such a picture.

This chapter takes a political economy approach to the formation of JVs. I adopt the insight of quid pro quo DFI introduced by Bhagwati (1985) and developed and extended by Bhagwati et al. (1987, 1992), Dinopoulos (1989, 1992), Wong (1989) and the previous chapter. Quid pro quo DFI occurs when the foreign firm invests in period one with a loss, but with a view to defusing the threat of protection against its exports in period two, thereby maximizing two-period total payoffs. In particular, I study the type of DFI that defuses lobbying incentives of both the competing firm and labor against foreign imports in the host country--quid pro quo JV, which has been absent in the literature. We also analyze the phenomenon that while labor unions may welcome full ownership DFI, the home competing firm does not.

I model a two-period-three-stage game between a foreign firm, a home firm and a home labor union. The firms maximize their respective profits while the union maximizes its utility which depends on union employment and an exogenously given wage rate. The foreign firm has better production technology than the home firm.[1] Following the quid pro quo DFI literature, I assume that in the first period, trade is free; in the second period, trade is restricted according to a VER determined by costly lobbying of the home firm and the labor union. The foreign firm acts as a Stackelberg leader in choosing whether to undertake full ownership DFI, or to form a JV with the home firm, or not to do DFI at all in each period.

Quid pro quo political-economy considerations (in addition to lobbying) are set up as follows: a) Increase in first-period DFI by the foreign firm relaxes the second-period trade restrictions because DFI increases union employment and in turn its utility. This assumption captures the idea that while imports cost jobs, DFI creates jobs and hence is to the liking of policy-makers. b) Increase in the home firm's share of the JV profit in the first period raises the second-period imports allowed because the home firm's total profit increases. This assumption captures the GM-Toyota JV example mentioned above. As will be shown in later sections, assumption (a) creates quid pro quo DFI while assumption (b) creates quid pro quo JV. The term 'quid pro quo' means that by investing in the first period at a loss, the foreign firm changes the attitudes of the labor union and the home firm, as well as the policy-makers, in favor of foreign imports in the second period.

The model produces contrasting results with and without quid pro quo political economy considerations. (I). In the absence of such political-economy considerations, 1) the foreign firm never forms a JV with the home firm, since more JV DFI results in higher total lobbying from the union and the firm than full ownership DFI does. As a consequence the imports allowed are lower under a JV. This is so because either full ownership DFI or JV reduces the marginal lobbying benefit of the union; while only full ownership DFI reduces the marginal lobbying benefit of the firm, but JV increases the profit and hence the lobbying of the firm. 2) the foreign firm does not undertake full ownership DFI in the first period with free trade because DFI incurs a sunk cost and reduces its profits. (II). In the presence of such political-economy considerations, the foreign firm prefers JV to full ownership DFI, because a JV results in lower total lobbying from the home firm and the labor union than a full ownership DFI does. Hence the only configuration is the formation of a quid pro quo JV. III). The labor union is indifferent between a full ownership DFI and a JV, while the home firm is better off under a JV than a full ownership DFI with or without political economy considerations.

The formation of JV is modeled as a cooperative Nash bargaining game, in which the two firms determine the output of the JV and the share of the costs and profits of the JV each firm has. When a JV is formed, it uses the advanced technology of the foreign firm. Thus the total profits of the two firms increase for given inputs. This formulation of the JV is different from a horizontal or vertical merger, through which the firms may increase market power. In our model, the formation of the JV increases the number of firms from two to three (the home firm, the foreign firm and the JV). The increase in profits comes from the use of the better production technology. The foreign firm is better off because it penetrates the home market, and the home firm is better off because of advanced technology. The model generates the standard result that the two firms allocate resources such that the world marginal revenue equals the marginal cost of the JV and that they share the JV profit according to their respective relative bargaining powers.

Section 3.2 constructs the basic model, section 3.3 studies the relationship between full ownership DFI, JV and endogenous lobbying, section 3.4 establishes quid pro quo JV, section 3.5 concludes.

3.2 The Basic Model

There are two firms located in two countries Home and Foreign, producing an homogeneous product. The foreign firm can produce in both countries but sells only in country Home, while the home firm produces and sells only in country Home. There is also a labor union in country Home. Capital and labor are the two factors of production. For the foreign firm, one unit of output requires exactly one unit of capital and one unit of labor; the home firm has higher unit input requirements than the foreign firm, with the capital-labor ratio remaining at one.[2] Transportation cost is zero. We also assume that when producing in country Home, the foreign firm incurs a sunk cost. Thus in the absence of trade restrictions, the foreign firm produces only in Foreign and exports to Home with equal factor prices across countries.

Following the quid pro quo DFI literature, I assume two periods in the model. In the first period trade is free. In the second period, trade is restricted by a VER imposed on the foreign firm according to the endogenous lobbying of the home firm and the labor union. The following table describes the interactions among the two firms and the labor union in the two periods.

Period	Stage	Player	Decision	Objective function
I	1	foreign firm	output, pattern of DFI (full ownership DFI or JV)	2-period discounted profits
	2	home firm	output	1st-period profit
II	1	foreign firm	pattern of DFI (with VER)	2nd-period profit
	2	home firm, labor union	level of lobbying	profit/utility
	3	home firm	output	2nd period profit

The above table describes a 3-stage game by the three players. Though this setup is standard in the quid pro quo DFI literature, a few remarks need to be made here. The foreign firm is treated as a Stackelberg leader for two reasons: it has advanced technology and I want to study the impact of DFI on future lobbying and protection. When faced with future protectionist threats against its exports, the foreign firm has two options in this model -- full ownership DFI and JV, while the literature only examines full ownership DFI. The assumption of two periods with free trade in the first period enables me to study whether the foreign firm undertakes quid pro quo JV or full ownership DFI in the first period, through which it may incur losses.[3]

To ensure subgame perfectness, the above game is solved backwards.

3.3 DFI, JV and Endogenous Lobbying

In the last stage of the game, the home firm chooses output to maximize profits. I solve the home firm's problem for three different cases in the two periods: 1). the foreign firm does not undertake full ownership DFI or JV, 2). the foreign firm undertakes full ownership DFI, 3). the foreign firm forms a JV with the home firm in country Home. The objectives of this section are to show that in the absence of quid pro quo political economy considerations, the foreign firm never forms a JV with the home firm; full ownership DFI is the unique equilibrium. The results are summarized in proposition 3.1.

3.3.1 The Benchmark Case -- Free Trade Equilibrium

In the absence of trade restrictions and quid pro quo political-economy considerations, the foreign firm does not undertake full ownership DFI or JV. This corresponds to case (1) mentioned above, which only occurs in the first period. Let X be the output of the foreign firm in country Foreign and Y be the output of the home firm. The world output is identical to X+Y, and the inverse demand function is $P = P(X+Y)$, where $P' < 0$ and $P'' < 0$. Denote R^* and W^* the rental and wage rate in Foreign and R and W the rental and wage rate in Home. I assume

$R^* \leq R,\ W^* \leq W$. For the foreign firm, one unit of output requires one unit of capital and labor respectively. Its profit function from exports can be written as

$$\Pi^X = [P(X+Y)-(R^*+W^*)]X \tag{3.1a}$$

For the home firm, one unit of output requires more than one unit of capital and labor respectively. Its profit function can be written as

$$\Pi^Y = [P(X+Y)-\delta(R+W)]Y \tag{3.1b}$$

where $\delta > 1$ is a constant.

If the foreign firm only maximizes one-period profit, the equilibrium is characterized by a simple Stackelberg leader-follower quantity game, where the foreign firm anticipates the home firm's output decision when choosing its own output while the home firm reacts to the foreign firm's output.

3.3.2 Second Period Analysis -- Lobbying and VER

In the second period, the foreign firm's exports, X, are restricted by a VER, which in turn is determined by the lobbying of the home firm and the labor union. To maximize profits, the foreign firm invests and produces in country Home. The investment can have either of two types, one is full ownership DFI, the other is to form a JV with the home firm. The two cases are studied sequentially.

3.3.2.1 Lobbying and Full Ownership DFI

If the foreign firm undertakes full ownership DFI, the world inverse demand function becomes P = P(X+Y+Z), where Z is the output of the foreign subsidiary. Here X is a function of the home firm's lobbying L^f and the union's lobbying L^u, such that X = $X(L^f,L^u)$, with $X_{L^f} < 0,\ X_{L^u} < 0,\ X_{L^fL^f} > 0,\ X_{L^uL^u} > 0.$

The home firm's profit function becomes

$$\Pi^{Y} = [P-\delta(R+W)]Y - C(L^{f}) \tag{3.2}$$

where C(.) is the cost of firm lobbying, with C' > 0, C" > 0. The firm chooses output Y to maximize profit in the last stage. The first order condition (FOC) is

$$P(X+Y+Z) - \delta(R+W) + YP'(X+Y+Z) = 0 \tag{3.3}$$

From condition (3.3) we have the optimal output $\hat{Y}$ as

$$\hat{Y} = Y(X, Z, \delta, R, W) \tag{3.4}$$

with $\partial Y/\partial X < 0,\ \partial Y/\partial Z < 0,\ \partial Y/\partial \delta < 0,\ \partial Y/\partial R < 0,\ \partial Y/\partial W < 0.$ Increases in the competitor's outputs X or Z tend to reduce $\hat{Y}$, increases in any of $\delta,\ R,\ W$ raise the cost of production and reduce the equilibrium output $\hat{Y}$.

In the second stage, the home firm and the labor union lobby for the VER. I assume that they lobby independently and that the optimal level of lobbying for each is determined in a Cournot fashion. That is, each lobbies to the point where marginal benefit of lobbying equals marginal cost, taken as given the other's lobbying. I realize that in this model, the VER has the nature of a public good and that there may be free-riding of lobbying between the home firm and the labor union. I abstract from analyzing free-rider problems for analytical convenience, and because my focus is on the formation of JV[4].

The labor union's problem is studied first. I model the union simply as if it maximizes a utility function in which both the real wage and the level of employment enter positively (see McDonald and Solow, 1981 and Brander and Spencer, 1981), while the effort of lobbying enters negatively (see Holmstrom, 1979), such that

$$U(W,Y,Z,L^{u}) = (Y+Z)\phi(W) + [N-(Y+Z)]\phi(\bar{W}) - V(L^{u}) \tag{3.5a}$$

where (Y+Z) union members are employed at wage rate W, N-(Y+Z) union members are earning the competitive wage $\bar{W}$ in the outside good sector, and $\phi' > 0$, $\phi'' < 0$. L^u is the union's lobbying with direct disutility to the union, and V' > 0, V" > 0. The advantage of using this utility function instead of the Stone-Geary function (see Chapter 2) is the simpler algebra yielded by the former in this chapter, though applying the latter does not alter the qualitative nature of the results. I further simplify the analysis by assuming that W is exogenously given, with $W > \bar{W},$ so that the union is only interested in increasing employment in the sector in consideration. This assumption enables the model to yield simple results without going to a four-stage game. In Chapter 2, I endogenized the union wage.

With the above simplifications, since $W, \bar{W}$ and n are all just parameters, the union's utility function can be written as (3.5b) without loss of generality

$$U(Y,Z,L^u) = (Y+Z) - V(L^u) \tag{3.5b}$$

Substituting the optimal level of output of the home firm in equation (3.4) into the union's utility function (3.5b), differentiating it with respect to L^u and applying condition (3.3), I obtain

$$U_{L^u} = Y_X X_{L^u} - V' = 0 \tag{3.6a}$$

where $Y_X = \frac{\partial Y}{\partial X}$, $X_{L^u} = \frac{\partial X}{\partial L^u}$. Condition (3.6a) implicitly defines the level of lobbying for the labor union under full ownership DFI. In the absence of free riding, the union lobbies until its marginal benefit of lobbying equals marginal cost.

Totally differentiating (3.6a) yields (see Appendix A)

$$\frac{dL^u}{dZ} < 0 \tag{3.7a}$$

Condition (3.7a) implies that an increase in full ownership DFI tends to reduce the level of lobbying from the union. The reason is that $Y_{XZ} > 0$: Even though DFI increases the union employment and hence its utility for every level of union lobbying, with $Y_{XZ} > 0$, DFI decreases the union's marginal benefit of lobbying, but not its marginal cost. The change of the union's marginal benefit of lobbying can be expressed as

$$\frac{\partial(Y_X X_{L^u})}{\partial L \partial Z} = Y_{XZ} X_L < 0$$

Since $X_{L^u} = \partial X / \partial L^u < 0,$ we thus have $\partial X / \partial Z = X_{L^u}(dL^u / dZ) > 0,$ which implies that more DFI induces the union to lobby less and in turn tends to increase the VER allowed. This substitutability relationship between DFI and import restrictions occurs because here I only considered the employment effects of DFI, with the union wage rate being exogenously given. This is in contrast to the complementarity relationship found in Chapter 2, where the employment effect was cancelled due to the simultaneous determination of lobbying and employment, and only the wage effect was considered.

I now turn to the home firm's lobbying. Substituting the optimal level of output in (3.4) into the home firm's profit function in (3.2), differentiating it with respect to L^f and applying condition (3.3), one obtains

$$YP' X_{L^f} - C' = 0 \tag{3.8a}$$

where $X_{L^f} = \partial X / \partial L^f.$ Condition (3.8a) implicitly defines the level of lobbying for the home firm under full ownership DFI. Totally differentiating (3.8a) yields (see Appendix A)

$$\frac{dL^f}{dZ} < 0 \tag{3.9a}$$

Condition (3.9a) implies that increases in full ownership DFI tends to reduce the level of lobbying of the home firm. The reason is that DFI reduces the home firm's market share and profits for every level of lobbying, which in turn reduces the firm's marginal benefit of lobbying but not the marginal cost. And since $X_{L^f} = \partial X / \partial L^f < 0$, I thus have $\partial X/\partial Z = X_{L^f}(dL^f/dZ) > 0$, which implies that because more DFI reduces the home firm's lobbying, this tends to increase the VER allowed.

Notice that from conditions (3.7a) and (3.9a), the lobbying from the union and the home firm both decrease as a result of more DFI, and hence the resulting VER increases.

When the optimal levels of lobbying from the union and the home firm are determined, so is the VER, $X(L^f, L^u)$. In the first stage of the game, the foreign firm takes the VER as given and chooses the level of full ownership DFI to maximize second-period profits. Its total profits from the two subsidiaries are

$$\Pi^* = [P-(R^*+W^*)]X + [P-(R+W)]Z - F \tag{3.10}$$

where F is the sunk cost of producing overseas. The foreign firm chooses Z to maximize equation (3.10), taking into account the impact of DFI on the profit from exports through the price. Apparently the foreign firm's profit in the second period (with VER) is less than that in the first period (with free trade, see equation (3.1a)) for each level of total output, because when undertaking DFI in the second period, it incurs the sunk cost F.

3.3.2.2 Lobbying and joint ventures

Since the foreign firm has advanced technology, it can also induce the home firm to form a JV in country Home. I assume that the JV will only be formed if the profits of both firms increase. Appendix B proves that under certain conditions there exists such an equilibrium.

Let Z denote the output of the joint venture. The world output can be written as (X+Y+Z), and the inverse demand function is P = P(X+Y+Z). I assume that the JV uses the foreign firm's advanced technology. The home firm contributes a share, s, to the JV's production cost and in return gets the same share, s, of the JV's profit. (1-s) share goes to the foreign firm. The profit functions for the home firm and the foreign firm under JV respectively are

$$\Pi = \Pi^Y + s\Pi^Z = [P - \delta(R+W)]Y - C(L^f) + s\{[P-(R+W)]Z - F\} \qquad (3.11a)$$

$$\Pi^* = \Pi^X + (1-s)\Pi^Z = [P-(R^*+W^*)]X + (1-s)\{[P-(R+W)]Z - F\} \qquad (3.11b)$$

For the labor union, the utility function is the same as in equation (3.5b), since the union employment and wage structure remain the same as under full ownership DFI.

Again in the last stage of the game, the home firm maximizes profit by choosing output Y. The FOC is

$$(Y+sZ)P' + P - \delta(R+W) = 0 \qquad (3.12)$$

Condition (3.12) implies that in choosing output for its own production, the home firm also considers its impact on the JV's profits. Condition (3.12) implicitly defines the optimal output for the home firm as

$$\hat{Y} = Y(X, Z, s, \delta, R, W) \qquad (3.13)$$

Totally differentiating condition (3.13) yields $\partial Y/\partial X < 0$, $\partial Y/\partial Z < 0$, $\partial Y/\partial s < 0$, which implies that increases in the outputs of the foreign firm and the JV, and the home firm's share of the JV all reduce the home firm's output.

In the second stage, the labor union and the home firm lobby independently for the VER. I look at the union first. Substituting the optimal output $\hat{Y}$ in (3.13) into the union's utility function in (3.5b), differentiating it with respect to L^u and applying condition (3.12), one obtains

$$Y_X X_{L^u} - V' = 0 \tag{3.6b}$$

where $Y_X = \partial Y / \partial X$, $X_{L^u} = \partial X / \partial L^u$. Condition (3.6b) determines the optimal lobbying for the union under JV, it is the same as condition (3.6a). And it is no surprise that by totally differentiating condition (3.6b), one obtains (see Appendix A)

$$\frac{dL^u}{dZ} < 0 \tag{3.7b}$$

which is exactly as (3.7a). The reason is that the union is indifferent between a JV and a full ownership DFI, because they both stay in country Home and provide the same level of employment and hence utility to the union, ceteris paribus.

Now we turn to the home firm's lobbying. Substituting the optimal level of output into the home firm's profit function in (3.11a), differentiating it with respect to L^f and applying condition (3.12), one obtains

$$(Y+sZ)P'X_{L^f} - C' = 0 \tag{3.8b}$$

where $X_{L^f} = \partial X / \partial L^f$. Condition (3.8b) implicitly defines the optimal level of lobbying for the home firm under JV. Totally differentiating (3.8b) yields (see Appendix A)

$$\frac{dL^f}{dZ} < 0, \ \frac{dL^f}{ds} > 0 \tag{3.9b}$$

Condition (3.9b) implies that on the one hand, increases in the JV output reduce the market share and profit of the home firm for every level of lobbying, which weakens the home firm and in turn reduces its lobbying; on the other hand, increases in the home firm's share of the JV profit strengthens the firm and induces it to increase lobbying.

When comparing condition (3.9b) with (3.9a), one sees that the home firm is more likely to lobby more under JV than under full ownership DFI in the absence of quid pro quo political-economy considerations. Since the union is indifferent between the two types of DFI and provides the same level of lobbying in each case, the resulting VER is lower under JV than under full ownership DFI. As a consequence, the foreign firm's profit is lower under JV than under full ownership DFI (see proposition 3.1).

In the first stage, the foreign firm and the home firm form a JV in production. Recognizing the bilateral nature of negotiations between partners in the JV, I model the formation of the JV as a cooperative Nash bargaining process. The two firms bargain to determine the output of the JV and the share of production costs and profits. The Nash solution is obtained by maximizing the generalized Nash product, which is a product of the payoff functions for the two firms, net of opportunity costs as measured from the threat point (status quo).

When the bargaining breaks down, the status quo point is a Nash-Cournot equilibrium. From the analysis in the previous sections, this corresponds to the foreign firm undertaking full ownership DFI only. Hence the conflict payoffs to the two firms can be treated as given in the generalized Nash product. Thus

$$G(Z,s) = (\Pi - \bar{\Pi})^{\alpha} (\Pi^{*} - \bar{\Pi}^{*})^{1-\alpha} \tag{3.14}$$

where Π, Π^{*} are given by equation (3.11), $\bar{\Pi}$, $\bar{\Pi}^{*}$ respectively are the conflict payoffs to the home firm and the foreign firm and are treated as given, α is the relative bargaining weight of the home firm.

The two firms choose Z and s to maximize the generalized Nash product. The FOC is

$$G_{s} = G\left(\frac{\alpha}{\Pi-\bar{\Pi}} - \frac{(1-\alpha)}{\Pi^{*}-\bar{\Pi}^{*}}\right) [P-(R+W)Z-F] = 0 \tag{3.15a}$$

$$\begin{aligned} G_Z &= \frac{\alpha G}{\Pi-\bar{\Pi}}\{\, YP'+[P-\delta(R+W)]\frac{dY}{dZ}+s[P-(R+W)]+sZP' \,\} \\ &+ \frac{(1-\alpha)G}{\Pi^*-\bar{\Pi}^*}\{\, XP'+(1-s)ZP'+[P-(R^*+W^*)]\frac{dX}{dZ}+(1-s)[P-(R+W)] \,\} \\ &= 0 \end{aligned} \tag{3.15b}$$

Solving (3.15a) and (3.15b) simultaneously yields

$$P+(X+Y+Z)P'-(R+W)+[P-\delta(R+W)]Y_Z+[P-(R^*+W^*)]X_Z=0 \tag{3.16a}$$

$$\frac{\alpha}{\Pi-\bar{\Pi}} = \frac{1-\alpha}{\Pi^*-\bar{\Pi}^*} \tag{3.16b}$$

where $Y_Z = \partial Y/\partial Z,\ X_Z = dX/dZ.$ Condition (3.16a) implies that the two firms should allocate resources among the three subsidiaries such that the world marginal revenue is equal to the marginal cost of the JV, not the marginal cost of the home firm, taking into account the JV's impact on the other two subsidiaries (the home firm's output and the foreign firm's exports). When condition (3.16a) is met, as shown by appendix B, there exists an equilibrium in which both firms are better off forming a JV. Condition (3.16b) implies that the two firms allocate the JV profit between themselves according to their respective bargaining weights.

To recapture this section, the main results are summarized in the following proposition.

Proposition 3.1: i). The labor union is indifferent between a full ownership DFI and a JV. ii). Increase in DFI in the form of either full ownership DFI or JV reduces the level of union lobbying. iii). Increase in full ownership DFI reduces the level of the home firm's lobbying. iv). Increase in JV DFI reduces the home firm's lobbying. However, an increase in the home firm's share of the JV profit tends to raise its lobbying.

From proposition 3.1, it can be seen that in the absence of quid pro quo political-economy considerations, when both the labor union and the home firm lobby, increase in DFI decreases lobbying from both the union and the firm, while increase in s increases lobbying from the firm but does not have any effect on the union's lobbying, thus the foreign firm never forms a JV with the home firm. The unique equilibrium is full ownership DFI by the foreign firm.

3.4 Quid Pro Quo Joint Ventures

In this section, quid pro quo political-economy considerations are included in the model. I consider the idea that first-period DFI by the foreign firm either in the form of full ownership DFI or JV reduces second-period restrictions on the foreign firm's exports. I assume that the VER, X, is a function of four variables, i.e.

$$X = X(L^f, L^u, Z_o, s\Pi^Z{}_o) \tag{3.17}$$

where L^u and L^f are lobbying from the union and the home firm respectively, and as in the previous section $X_{L^f} < 0$, $X_{L^u} < 0$, $X_{L^fL^f} > 0$, $X_{L^uL^u} > 0$. Z_o is DFI in the first period, $s\Pi^Z{}_o$ is the home firm's share of the JV profit in the first period, and $\partial X / \partial Z_o > 0$ for the labor union and $\partial X / \partial (s\Pi^Z{}_o) > 0$ for the home firm. The last two arguments capture the quid pro quo political-economy considerations: increase in first-period DFI raises the second-period VER allowed because DFI creates employment and politicians are likely to ease trade restrictions accordingly[5]; increase in the home firm's share of the JV profit in the first period raises the second-period VER allowed because the home firm learns the foreign firm's better technology and increases its total profits, which again pleases politicians.

Even though the increase in union employment Z_o and the increase in the home firm's share of the JV profit $s\Pi^Z{}_o$ in the first period both raise the second period VER allowed with quid pro quo political-economy considerations, it is not true that the foreign firm will choose to undertake both full ownership DFI and JV DFI. In fact the objectives of this section are to show that with such political economy considerations, a). even in the absence of trade restrictions, the foreign firm has incentives to undertake DFI or JV in the first period; b). JV is a better strategy than full ownership DFI for the foreign firm.

Denote all first-period variables with a subscript '$_o$'. With quid pro quo political-economy considerations, first-period DFI does not affect the output of the home firm in the second period directly but indirectly, that is, Z_o affects Y only through its impact on the VER X and on lobbying. Hence to see these effects, we go directly to the second stage of the game, the determination of lobbying and VER. Again I study two cases: quid pro quo DFI and quid pro quo JV, sequentially.

For the labor union, substituting the new VER function in (3.17) into the FOC (3.6a) yields

$$Y_X X_{L^u}(L^u, s\Pi^Z{}_o, Z_o) - V' = 0 \tag{3.18a}$$

Condition (3.18a) implicitly defines the optimal level of lobbying for the union with political economy considerations: the union lobbies to the point where marginal revenue equals marginal cost. Totally differentiating condition (3.18a) yields (see Appendix A)

$$\frac{dL^u}{dZ_o} < 0 \tag{3.19}$$

Condition (3.19) implies that increase in first-period full ownership DFI decreases second period union lobbying with quid pro quo political-economy considerations. Since $X_{L^u} < 0$ and $\partial X/\partial Z_o > 0,$ I thus establish

$$\frac{dX}{dZ_o} = \frac{\partial X}{\partial Z_o} + X_{L^u}\frac{dL^u}{dZ_o} > 0 \tag{3.20}$$

Condition (3.20) implies that increase in first-period DFI with quid pro quo political-economy considerations raises the second-period VER allowed through two channels: one is the assumption of quid pro quo political-economy considerations, the other is DFI's impact on VER through the changes in union lobbying. Both effects are positive. This is what Bhagwati called 'quid pro quo DFI'.

For the home firm, under full ownership DFI, s = 0, and $\partial X / \partial(s\Pi^Z{}_o) = 0,$ hence $dL^f / d(s\Pi^Z{}_o) = 0.$ Thus the relationship in condition (3.9a) remains; that is, $dL^f / dZ < 0.$ Here, the reduction of the home firm's lobbying is not a consequence of quid pro quo political economy considerations, as is the case for the labor union's lobbying. Rather it remains the impact of full ownership DFI on the firm's endogenous lobbying--decreasing marginal benefit.

Next, I analyze the case of quid pro quo JV.

For the labor union, substituting the new VER function in (3.17) into FOC (3.6a) and totally differentiating it, one obtains condition (3.19) again. Thus the impact of a JV on the union is the same as that of a full ownership DFI in the presence of political economy considerations. The reason again is that the labor union is indifferent between full ownership DFI and JV, because they provide the same level of employment to the union.

For the home firm, the formation of a JV implies s > 0. Substituting the new VER function in (3.17) into the FOC (3.8b) yields

$$(Y+sZ)P'X'(L^f, L^u, s\Pi^Z{}_o, Z_o) - C' = 0 \tag{3.18b}$$

Condition (3.18b) implicitly defines the optimal level of lobbying for the home firm under JV with political economy considerations. Totally differentiating (3.18b) yields (see Appendix A)

$$\frac{dL^f}{dZ} < 0, \quad \frac{dL^f}{ds} > 0 \tag{3.21a}$$

$$\frac{dL^f}{dZ_o} < 0, \quad \frac{dL^f}{ds_o} < 0 \tag{3.21b}$$

Condition (3.21a) is the same as condition (3.9b), which does not include quid pro quo political-economy considerations; condition (3.21b) adds such political-economy considerations: first-period JV reduces the home firm's lobbying in the second period through two channels: the reduction of market share which weakens the home firm on the one hand and the increase of its share of the JV profit which reduces its lobbying due to political economy considerations on the other hand. From condition (3.21b) and the assumption that $\partial X / \partial(s\Pi^Z{}_o) > 0$, one has

$$\frac{dX}{d(s\Pi^Z{}_o)} = \frac{\partial X}{\partial(s\Pi^Z{}_o)} + X_{L^f}\left(\frac{dL^f}{ds_o} + \frac{dL^f}{dZ_o}\right) > 0 \tag{3.22}$$

Condition (3.22) implies that first-period JV investment increases second-period VER allowed with quid pro quo political-economy considerations, which makes the JV more attractive to the foreign firm than without such political economy considerations. This is what I call 'quid pro quo JV', to borrow from Bhagwati.

By comparing quid pro quo JV with quid pro quo DFI, I establish proposition 2.

Proposition 3.2: i). With quid pro quo political-economy considerations, the union is still indifferent between full ownership DFI and JV; and second-period union lobbying decreases. ii). under full ownership DFI, quid pro quo political-economy considerations do not affect the home firm's lobbying; under JV, such political-economy considerations reduce its second period lobbying.

Proposition 3.2 implies that in the presence of quid pro quo political-economy considerations, the foreign firm is better off undertaking JV with the home firm than full ownership DFI or no DFI at all in the first period, even though trade is only restricted in the second period. The reason is: quid pro quo JV results in lower total lobbying from the home firm and the labor union and in turn higher VER allowed. Therefore, as a Stackelberg leader, the foreign firm forms a JV with the home firm in the first period.

Finally, I analyze the impact of quid pro quo JV on the foreign firm's two period discounted total profits.

Under JV, the foreign firm's first-period profit function is

$$\Pi^*_o = [P-(R^*+W^*)]X_o + (1-s)\{[P-(R+W)]Z_o - F\} \qquad (3.23)$$

Differentiating equation (3.23) with respect to first-period JV DFI Z_o yields

$$\frac{\partial \Pi^*_o}{\partial Z_o} = X_o P' + (1-s)[P-(R+W)+Z_o P'] < 0 \qquad (3.24)$$

Condition (3.24) implies that in the absence of trade restrictions, increase in JV DFI reduces the foreign firm's total profits because the JV incurs a higher production costs than producing in country Foreign and it also replaces a portion of the foreign firm's exports.

The foreign firm's second period profit function under JV is

$$\Pi^* = [P-(R^*+W^*)]X(L(s\Pi^Z{}_o, Z_o), s\Pi^Z{}_o, Z_o) + (1-s)\{[P-(R+W)]Z-F\} \qquad (3.25)$$

Differentiating equation (3.25) with respect to first period JV DFI Z_o yields

where $[XP' + (1-s)ZP' + P - (R^*+W^*)] > 0$ from condition (3.16a). Condition (3.26) implies that first-period JV DFI by the foreign firm increases second-period total

$$\frac{\partial \Pi^*}{\partial Z_o} = \{X_{Z_o} + \frac{dX}{d(s\Pi^Z{}_o)} \frac{\partial (s\Pi^Z{}_o)}{\partial Z_o} + X_L [\frac{dL}{dZ_o} + \frac{dL}{d(s\Pi^Z{}_o)} \frac{\partial (s\Pi^Z{}_o)}{\partial Z_o}]\} \\ [XP' + (1-s)ZP' + P - (R^* + W^*)] > 0 \tag{3.26}$$

profits with quid pro quo political economy considerations.

The total discounted two-period profits of the foreign firm under JV is

$$\Phi = \Pi^*{}_o + \rho \Pi^* \tag{3.27}$$

where ρ is the constant discount factor, $\Pi^*{}_o$ and Π^* are given by equations (3.23) and (3.25). Differentiating equation (3.27) with respect to Z_o yields

$$\Phi_{Z_o} = (\Pi_o{}^*)_{Z_o} + \rho (\Pi^*)_{Z_o} \tag{3.28}$$

where $(\Pi^*{}_o)_{Z_o} = \partial \Pi^*{}_o / \partial Z_o$ and $(\Pi^*)_{Z_o} = \partial \Pi^* / \partial Z_o$ are given by conditions (3.24) and (3.26). From condition (3.28), it is clear that

if $-(\Pi_o{}^*)_{Z_o} / (\Pi^*)_{Z_o} < \rho$, then $\Phi_{Z_o} > 0$, the foreign firm's two period discounted total profits increase with JV investment in the first period.

3.5 Conclusions

The purpose of chapter 3 has been to construct a model of joint venture formation with political economy considerations as the main motivation. I adopted the insight of quid pro quo DFI, where the foreign firm invests in period one even with a loss, but with a view to defusing future protectionist threats and making more profits later. I modeled a two-period three-stage game among a foreign firm, a home firm and a home labor union interacting in the home market. The foreign firm has better production technology than the home firm. The home firm and the labor union lobby against foreign imports to maximize their respective objectives.

It is shown that i). in the absence of quid pro quo political-economy considerations, a JV is never formed because the foreign firm is better off under a full ownership DFI or no DFI at all; ii). in the presence of such political-economy considerations, the formation of a JV is the unique equilibrium because the foreign firm is better off under a JV; iii). the labor union is indifferent between a JV and a full ownership DFI while the home firm prefers a JV over a full ownership DFI.

There are many cases where JVs are formed due to political economy considerations, especially in less developed countries (LDC). Beamish (1985) found that 17% of JVs in developed countries while 57% in the LDCs were created for this reason. The conventional argument is that the host countries (especially LDCs) use JVs to induce foreign investment. But on the other hand, the foreign multinational may take advantage of the JV in penetrating the host country market and in the meantime mitigating nationalistic passions. I hope that this chapter has successfully explained the phenomenon that full ownership DFI brings an image of 'us versus them', while a JV does not.

Notes

1. I have in mind Japanese-U.S. joint ventures which resulted in technology transfer from the former to the latter.

2. The assumption of Leontief technology is designed for algebraic simplicity. It does not affect the qualitative results of this model.

3. Bhagwati et al. (1987, 1992), Dinopoulos (1989, 1992) and Zhao (1991) also used the two period set up.

4. Free-riding exists in almost any collective action. There is no simple solution to this problem. For a thorough discussion see Olson (1965).

5. In the literature of quid pro quo DFI, a probability function is usually adopted. Bhagwati et al. (1987) and Dinopoulos (1989) assume that increase in first-period imports increases the probability of second-period trade restriction, while increase in first-period DFI does the opposite.

CHAPTER 4
CROSS-HAULING DIRECT FOREIGN INVESTMENT AND UNIONIZED OLIGOPOLY

4.1 Introduction

It is widely believed that direct investment from a foreign country (inward) benefits workers while investment to a foreign country (outward) hurts workers. Unions conventionally blame firms for shifting jobs overseas, while firms argue that labor costs are a major decision to shift production abroad.[1] DFI was even a big issue in the 1992 US presidential race, in which the Democratic candidate Bill Clinton and independent candidate Ross Perot accused the Bush administration of supporting US firms to move production to foreign countries.[2] Many traditional models (except the Heckscher-Ohlin model)[3] of direct foreign investment (DFI) also reflect this point of view (see Jones, 1971 and Ethier, 1972): with sector-specific capital or nontraded goods, the influx of capital is shown to raise wages and lower rentals.

However, the attitude and the actions of labor groups suggest that the problem is not so simple. As early as two decades ago, Johnson (1971) observes that in Britain trade unions are generally hostile towards inward DFI.[4] The apparent reason is that DFI creates multinational firms(MNF). MNFs redistribute costs and benefits not only between countries (by shifting jobs and technology), but especially so between labor and capital (through increased mobility and improved bargaining position vis-a-vis labor). When a firm becomes multinational, on the one hand, employment stability for labor is reduced; on the other hand, strikes by unions only affect portions of the firm's earnings, in contrast to the total earnings when it operates solely in a single country. In short, inward DFI may create some jobs, but " in American organized labor's view, [they are] not a welcome trade-off for a decrease in bargaining position. The leadership of the AFL-CIO . . . is apparently no more eager to deal with a multinational Mitsubishi than with a multinational Dow Chemical." And "unions in countries that traditionally play host to subsidiaries share the view of the AFL-CIO (Bergsten et al., 1978, p.100)."

Apparently traditional models, which solely focuses on one way DFI, do not provide satisfactory explanations to the above problems. Several researchers have drawn attention to the phenomenon of a two-way, mutually penetrating DFI. This phenomenon was called 'cross-investment' by Hymer and Rowthorn (1970), 'cross-hauling' by Caves (1971), 'mutual penetration of investment' by Bhagwati (1982) and 'two way capital flow' by Jones et al. (1983). However, the literature on this phenomenon has two shortcomings: first, it focuses solely on perfect competition and assumes away the role of a very important player, the labor union as described above; second, cross-hauling DFI is supposed to occur in two different sectors due to the assumption of sector-specific resources. Yet in real life we see cross-hauling DFI occurring within the same sector. To name a few, examples are: 1). while U.S. automobile makers (e.g. General Motors) have subsidiaries in Europe, European automobile makers (e.g. BMW) also produce in the U.S.; 2). the U.S. food manufacturer Kellogg and Swiss food manufacturer Nestle produce in both the U.S. and Europe.

Chapter 4 models the mutual penetration of different capital markets from a different perspective. I want to highlight the interaction between labor unions and intra-industry (within-sector) cross-hauling DFI. I construct a partial equilibrium model of intra-industry cross-hauling DFI with unionized duopoly, where the wage rate and the level of employment are determined through simultaneous efficient Nash bargaining processes. The introduction of labor unions raises the negotiated wage rate above the competitive wage rate and in turn produces union rents and lowers firm profits. However if firms mutually penetrate each other country through DFI, while organized labor remains nationally independent, it is shown that with simultaneous efficient Nash bargains, the negotiated wage rates decrease for every level of employment, the firms' profits increase, while the levels of employment change depending on whether the union is wage oriented or employment oriented. As a result, union rent decreases and the Nash equilibrium moves closer to the monopoly firm and competitive labor outcome. Under cross-hauling DFI, national welfare increases (decreases) when the union is wage (employment) oriented.

I study three different equilibria of DFI in the presence of unionized markets: (1). no DFI by either firm, (2). one way DFI, (3). cross-hauling DFI. I show that under identical technologies across countries, if the sunk cost of DFI is sufficiently small, then cross-hauling DFI is the unique Nash equilibrium. I also study the conditions under which other equilibria can be Nash.

What happens to the negotiated wage rate and the firms' profits is not obvious with cross-hauling DFI, since cross-hauling DFI creates two types of interdependencies. The first is the interdependence of profits for the two branches (in two different countries) in each firm if the labor union strikes in one country. The second is the interdependence of employment between two firms in each country. To deal with these problems, I set up one bargaining game in each country. Solving the two games simultaneously takes care of the first interdependence; while letting two firms bargain against the labor union takes care of the second interdependence.

Jones et al.(1983) provide a general equilibrium, perfect competition model of cross-hauling DFI. They assume that capital is sector-specific but internationally mobile. When demand in the non-traded goods sector increases, capital has to be imported from overseas into this sector, while capital has to be exported in the traded-goods sector. Labor is mobile across sectors and is not organized. Dinopoulos (1986) also studies cross-hauling DFI in a model of trade in similar products. Cross-hauling DFI occurs because different national tastes interact, which provides incentives for mutual exchange of the activity-specific resources across firms in different countries.

The present model does not require a factor to be sector-specific or a resource to be activity-specific, yet it generates cross-hauling DFI endogenously by modeling the collective bargaining between the labor union and the MNFs. In contrast to Jones et.al.(1983) and Dinopoulos (1986), in the present model cross-hauling DFI occurs within a single sector, which produces a homogenous product. The role of the labor union is significant, which seems empirically more relevant. Indeed it is exactly the firm's intent to reduce the union wages and regain lost profits (union rents) due to unionization that creates cross-hauling DFI, which is why unions so often oppose DFI, be it inward or outward.

This chapter draws on the recent literature on efficient Nash bargaining between labor and management(see Mcdonald and Solow (1981) and Mezzetti and Dinopoulos (1991)). The Nash bargaining solution used here has the property that when the bargaining breaks down, the firm's reservation profit (conflict payoff) increases above zero if it undertakes cross-hauling DFI, while the union's reservation utility (conflict payoff) stays at zero. Hence the firm's bargaining position improves relatively, which works to the disadvantage of national labor unions.

I assume a two-stage game of cross-hauling DFI. In the first stage, firms decide whether to undertake DFI or not; in the second stage, they engage in two simultaneous efficient Nash bargaining games with the national labor unions to determine the wage rates and the levels of employment. To ensure subgame perfectness, the game is solved backwards.

In the rest of the paper, I first present two benchmark cases to analyze the effects of unionization on wages and profits: 1). the monopoly firm and competitive labor equilibrium, 2). the monopoly firm and unionized labor equilibrium, but without DFI. Then I go to the second stage of the DFI game to determine the negotiated wages and employment through efficient Nash bargaining. Cross-hauling DFI is generated endogenously as a result of the firms' attempts to improve their bargaining positions vis-a-vis the national unions in the first stage. To follow that, I study the asymmetric case where one firm undertakes DFI while the other does not. And it is only proper that after the above cases are studied, I compare all different equilibria. Finally, I analyze the welfare implications of cross-hauling DFI.

With the above in mind, the rest of the chapter is organized as follows: section 4.2 develops the model of cross-hauling DFI; section 4.3 studies the asymmetric case: one way DFI; section 4.4 compares different equilibria of DFI and analyzes the welfare implications of cross-hauling DFI; section 4.5 offers conclusions and further extensions.

4.2 A Model of Cross-hauling DFI

There are two firms A and B in two countries the U.S. and Europe. Firm A locates in the U.S. and B in Europe. The two firms produce a homogenous product and compete in the world market. The world demand is characterized by the inverse demand function: $P = P(X+Y)$, with $P' < 0$, where X and Y denote the outputs in the US and Europe respectively. Labor is the only factor of production and is country specific. Constant returns to scale prevails in production with one unit of input produces one unit of output, hence X and Y also denote the employment levels in the US and Europe. The wage rate, W, is the only cost. When undertaking DFI, besides the above mentioned technology, a firm has to incur a sunk cost F in the first stage of the game. The sunk cost can be interpreted as training costs or advertising costs that are not recoverable once invested. I also assume that in this partial equilibrium model, the concerned sector is small relative to the economy, thus X and Y are also small relative to the total labor force in the two economies. There are identical technologies across countries, both firms are identical in every respect. Transportation costs are zero everywhere.

4.2.1 Competitive Labor Markets

I begin with the simplest case, where there are no organized labor unions in either country. Then the wage rate will be the same as the competitive wage rate in the outside-good sector in each respective country. I assume the competitive wage is equal across countries. The profit for firm A is

$$\Pi = (P-\bar{W})\ X \tag{4.1a}$$

and the profit for firm B is

$$\Pi^{*} = (P-\bar{W})\ Y \tag{4.1b}$$

where $\bar{W}$ is the competitive wage rate, X and Y represent the outputs of A and B respectively, and P(X+Y) is the inverse demand.

Suppose that the two firms compete in a Cournot fashion, where each chooses its own output to maximize profit, taking the other's output as given. I easily obtain the equilibrium (M in figures 4.1 and 4.2): X = Y; the equilibrium wage rate is $\bar{W}$ and the profits are as shown in (4.1a) and (4.1b). Each firm produces in its own country. There may be trade, but definitely no DFI. If trade occurs, it is due to the difference of tastes in the two countries. A country which demands more of the product than its output will import.

4.2.2 Unionized Labor Markets

Now let me introduce two independent national labor unions, one into each country. The objective is to show that with the introduction of unions, the negotiated wage rates increase, union rents appear and the firms' profits decrease. Hence firms will find incentives to curb union bargaining powers and to undertake DFI . The structure of efficient Nash bargaining in this subsection resembles that of McDonald and Solow (1981) and Mezzetti and Dinopoulos (1991), which is a building block for my analysis of cross-hauling DFI in later sections.

With labor organized, the wage rate is no longer competitive. Instead it is determined through negotiations between labor and the firm in each respective country. I assume that the labor unions are not only interested in a higher wage rate, but also higher employment. In modeling the objective functions of the unions, I adopt a modified Stone-Geary utility functional form:[5]

$$U(W,X) = (W-\bar{W})^{\theta} X^{\gamma} \tag{4.2a}$$

$$U^{*}(W^{*},Y) = (W^{*}-\bar{W})^{\theta} Y^{\gamma} \tag{4.2b}$$

where W and W* represent respectively the negotiated wages in the US and Europe, hence $(W-\bar{W})$ and $(W^{*}-\bar{W})$ represent the excess wages. In the 'managerial' trade union model by Pemberton (1988), (4.2) is the bargained outcome between union membership and leadership, with the former emphasizing wage differentials and the latter union employment (size). The parameters $\theta \geq 0$ and $\gamma \geq 0$ correspond to the bargaining powers of workers and of leadership respectively. If $\theta > \gamma$, then the union is called wage oriented; if $\theta < \gamma$, then the union is called employment oriented (Mezzetti and Dinopoulos, 1991). Observe in (4.2) that I implicitly assume equal bargaining powers for the two unions (same parameters).

The wage rate and the level of employment are determined through a cooperative Nash bargaining process between the union and the firm in each country. The bargaining in the two countries are simultaneous and independent, which implies that in the US bargaining game, the European wage rate and employment are taken as given, and vice versa. This implies that the relevant demand is the residual demand in each country given the other country's output.

I start with the case where neither firm attempts to move production abroad (a condition to be relaxed in the next subsection). As usual, the firm's objective function is its profit function. In case of disagreement, the union strikes and both the firm's profit and the union's utility are driven down to zero. In the spirit of Binmore et.al.(1986), this outcome (zero reservation profit for the firm and zero reservation utility for the union) is the threat point for both parties if bargaining breaks down. Therefore the generalized Nash products in the U.S. and Europe respectively are

$$G(W, X) = [(W-\bar{W})^{\theta} X^{\gamma}]^{\alpha} [(P-W)X]^{1-\alpha} \tag{4.3a}$$

$$G^{*}(W^{*}, Y) = [(W^{*}-\bar{W})^{\theta} Y^{\gamma}]^{\alpha} [(P-W^{*})Y]^{1-\alpha} \tag{4.3b}$$

where $\alpha \geq 0$ is the union's relative bargaining power.

The above games can be solved by choosing W and X to maximize G(.) and by choosing W* and Y to maximize G*(.). For simplicity, I assume symmetry across countries in the first order conditions, that is, both firms and both unions are identical, thus X = Y, W = W*. By imposing symmetry, I obtain respectively the following conditions for each country:

$$W = gP + (1-g)\bar{W} \tag{4.4}$$

$$W = kP + (1-k)(P + XP') \tag{4.5}$$

where $g = \frac{\alpha\theta}{\alpha\theta + 1 - \alpha}$, $k = \frac{\alpha\gamma}{\alpha\gamma + 1 - \alpha}$ and $0 \leq g, k \leq 1$. Please observe that in (4.4) and (4.5), the relevant demand, P, is the residual demand for each country. In other words, $P = P(X + \bar{Y})$, where $\bar{Y}$ is given for the bargaining in the US. Figures 4.1 and 4.2 plot the two first order conditions. I name the curve associated with equation (4.4) ‘the AA curve’ and that associated with equation (4.5) ‘the BB curve’. The AA curve states that the negotiated wage rate, W, is a weighted average of the price, P, and the

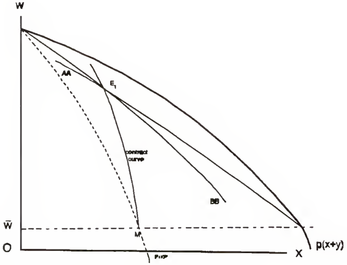

Figure 4.1: Wage Oriented Union

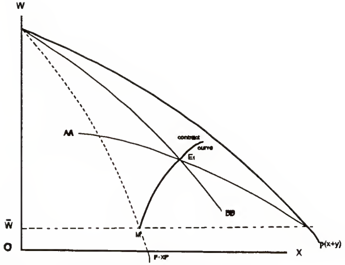

Figure 4.2: Employment Oriented Union

competitive wage rate, $\bar{W}$, in the outside-good (non-unionized) sectors. For a detailed discussion of the effects of α and θ on g and W, see Zhao (1991). The BB curve states that the negotiated wage rate is also a weighted average of the firm's residual inverse demand curve, $P(X+\bar{Y})$, and the residual marginal revenue (labor demand) curve, P+XP'. For a detailed discussion of the effects of α and γ on k and W, see Mezzetti and Dinopoulos (1991).

From the AA curve, one sees that unless the labor union does not possess any bargaining power $(\alpha=0)$, or the union is completely uninterested in wage differentials $(\theta=0)$, then $W>\bar{W}$, that is, the negotiated wage rate is above the competitive wage rate. From (4.4) one also obtains the firm's profit to be:

$$\Pi_O=(1-g)(P-\bar{W})X \tag{4.6}$$

This new profit level is only a fraction of the firm's initial profit without unions [see (4.1a)], for every level of employment. The other fraction:

$$R_O = g(P-\bar{W})X \tag{4.7}$$

becomes union rents. Thus the introduction of labor unions raises the wage rates and union rents and reduces the firms' profits.

As shown in figures 4.1 and 4.2, both the AA curve and the BB curve slope downward, but the latter is steeper. The AA curve goes through $P=\bar{W}$, while the BB curve goes through P = W. The intersection of the two curves determines the equilibrium levels of the wage rate and the employment in each country.

Combining equations (4.4) and (4.5), I also obtain the contract curve for each country given the other country's wage rate and employment:

$$\frac{\gamma}{\theta}(W-\bar{W}) = W-P-XP' \tag{4.8}$$

Condition (4.8) represents the locus of the tangency between the union indifference curves and the firm isoprofit contours on the wage-employment space. If $\theta < \gamma$ (i.e. the union is employment oriented), then the contract curve is positively sloped; if $\theta > \gamma$ (i.e. the union is wage oriented), then the contract curve is negatively sloped; if $\theta = \gamma$ (i.e. the union is equally concerned with employment and wage differentials), then the contract curve is vertical. The contract curve starts at $\bar{W} = P+XP'$, that is to say, economic bargaining starts when the firm's marginal revenue rises slightly above the competitive wage rate.

As shown in figures 4.1 and 4.2, the intersection of the AA curve and the BB curve is on the contract curve. If the union is wage oriented ($\theta>\gamma$), then the Nash bargaining equilibrium lies above and to the left of point M, which is the intersection of the marginal revenue curve and the competitive wage curve. In this case, the negotiated wage rate is high while the level of employment is low; if the union if employment oriented ($\gamma > \theta$), then the equilibrium lies above and to the right of point M. In this case, the level of employment is high while the negotiated wage rate is low but above the competitive wage rate; if the union is equally concerned with excess wages and employment ($\theta = \gamma$), the equilibrium lies straight above point M, and in this case, the negotiated wage rate is still above the competitive level and the level of employment is the same as the monopoly output without unions.

4.2.3 Cross-Hauling DFI

In the previous subsection, I showed that with the existence of unions, the negotiated wage rate and union rents increase while the firms' profits decrease. This subsection relaxes the assumption of no DFI by either firm. I begin by assuming that both firm A and firm B undertake cross-hauling DFI in the first stage (in section 4.3, we study the case where only firm A does DFI). Then in the second stage we have the two firms in each country bargaining against one national labor union for wages and employment. I solve the second stage first and analyze the effects of cross-hauling DFI on the negotiated wage rate, the level of employment, the union rents and the firm profits.

4.2.3.1 The second stage: simultaneous efficient Nash bargaining games

In the second stage of the game, the labor union and the two firms involve in simultaneous efficient Nash bargaining. As a result, the wage rate and the level of employment are determined.

It may seem apparent that with national labor unions, when the two firms in the US and Europe cross-invest in each other country, they can reduce the negotiated wage rates and increase profits, since they now have one more alternative--the overseas branch. But it is exactly this additional alternative that adds to the employment opportunity of union workers. Besides, as shown by (4.11) and (4.12), each firm's profit function enters the two generalized Nash products simultaneously and thus making the Nash products interdependent. All these blur the picture and clearing the above issues is the task of this subsection.

Let X_A and X_B respectively be the outputs of A and B in the US; Y_B and Y_A be the outputs of B and A in Europe, where $X_A + X_B = X$ and $Y_A + Y_B = Y$. W is the negotiated wage rate in the U.S. and W* in Europe. F is the sunk cost each firm incurs in the first stage for operating in a foreign country when undertaking DFI. The sunk cost F can be ignored in the second stage bargaining game, because it does not affect the decision and outcome of bargaining. Then A's and B's relevant profit functions in the US respectively are

$$\Pi_A = (P-W)X_A \tag{4.9a}$$

$$\Pi_B = (P-W)X_B \tag{4.9b}$$

A's and B's relevant profit functions in Europe respectively are

$$\Pi^*_A = (P-W^*)Y_A \tag{4.10a}$$

$$\Pi^*_B = (P-W^*)Y_B \tag{4.10b}$$

I assume that under cross-hauling DFI the wage rates and the levels of employment are determined through simultaneous efficient Nash bargaining games between the union and the two firms in the two countries. In other words, there is only one bargaining game in each country, in which both the wage rate and the level of employment are determined simultaneously by the three players: the union and the two firms. Firm participation in the bargaining is represented by the headquarters, not branches. One can think of a situation where each firm sends one agent to each country to participate in the bargaining. The agents understand that they represent the total interests (profits) of the firm, not just one branch. The agents from the same firm are not allowed to communicate during bargaining.

If bargaining breaks down and the union strikes in one country (assuming national unions and they strike independently), firms are multinationals and they can still produce in the other country. Hence the firms' profits (conflict payoff) do not go to zero while the striking union's utility (conflict payoff) goes to zero when bargaining breaks down. In fact, since the bargaining are simultaneous and no rebargaining is allowed, world output decreases and the profit of the branch that produces increases[6].

With the above assumptions of bargaining technology, the generalized Nash product for the US bargaining game can be written as

$$G(X_A, X_B, W) = U^{\alpha} (\Pi_A + \Pi^*{}_A - \bar{\Pi}^*{}_A)^{\beta} (\Pi_B + \Pi^*{}_B - \bar{\Pi}^*{}_B)^{1-\alpha-\beta} \tag{4.11}$$

where α, β represent relative bargaining powers of the two firms; U is the union's utility as defined in (4.2a); Π_A , Π_B , $\Pi^*{}_A$ and $\Pi^*{}_B$ are branch profits given by (4.9) and (4.10); $\bar{\Pi}^*{}_A = (\bar{P}(Y_A + Y_B) - W^*)Y_A$ and $\bar{\Pi}^*{}_B = (\bar{P}(Y_A + Y_B) - W^*)Y_B$ are the two firms' European branch profits when the bargaining in the US breaks down. Thus they represent the firms' conflict payoffs for the US bargaining game.

The generalized Nash product with cross-hauling DFI (4.11) differs from that without DFI (4.3) in that the conflict payoffs for the firms increase above zero, while the conflict payoffs for the national unions stay at zero. When the bargaining in the US breaks down, $Y = Y_A + Y_B$ is world output and world price increases to $\bar{P},$ which is higher than P, the world price (inverse demand) when both countries produce.

Similarly the generalized Nash product for the European bargaining game is:

$$G^*(Y_A, Y_B, W^*) = (U^*)^{\alpha} (\Pi^*{}_B + \Pi_B - \bar{\Pi}_B)^{\beta} (\Pi^*{}_A + \Pi_A - \bar{\Pi}_A)^{1-\alpha-\beta} \tag{4.12}$$

where $\bar{\Pi}_A = (\bar{P} - W)X_A$ is the conflict payoff for firm A and $\bar{\Pi}_B = (\bar{P} - W)X_B$ is the conflict payoff for firm B when bargaining in Europe breaks down.

By comparing the above two generalized Nash products, one sees that one bargaining game depends on the outcome of the other and vice versa, this is because firms are multinationals with cross-hauling DFI and their participation in the bargaining is represented by total profits from both branches in two different countries. Thus the relevant demand in the bargaining games here is the world demand.

Maximizing G(.) in (4.11) with respect to W, X_A and X_B, one obtains the following first order conditions for the U.S. bargaining game:

$$G_W = G[\frac{\alpha\theta}{W-\bar{W}} - \frac{\beta X_A}{\Pi_A+\Pi^*{}_A-\bar{\Pi}^*{}_A} - \frac{(1-\alpha-\beta)X_B}{\Pi_B+\Pi^*{}_B-\bar{\Pi}^*{}_B}]=0 \tag{4.13a}$$

$$G_{X_A} = G[\frac{\alpha\gamma}{X_A+X_B} + \frac{\beta(P-W+X_AP'+Y_AP')}{\Pi_A+\Pi^*{}_A-\bar{\Pi}^*{}_A} + \frac{(1-\alpha-\beta)(X_B+Y_B)p'}{\Pi_B+\Pi^*{}_B-\bar{\Pi}^*{}_B}]=0 \tag{4.13b}$$

$$G_{X_B} = G[\frac{\alpha\gamma}{X_A+X_B} + \frac{\beta(X_A+Y_A)P'}{\Pi_A+\Pi^*{}_A-\bar{\Pi}^*{}_A} + \frac{(1-\alpha-\beta)(P-W+X_BP'+Y_BP')}{\Pi_B+\Pi^*{}_B-\bar{\Pi}^*{}_B}]=0 \tag{4.13c}$$

Similarly the first order conditions for the European bargaining game are:

$$G^*{}_{W^*} = G^*[\frac{\alpha\theta}{W^*-\bar{W}} - \frac{\beta Y_B}{\Pi^*{}_B+\Pi_B-\bar{\Pi}_B} - \frac{(1-\alpha-\beta)Y_A}{\Pi^*{}_A+\Pi_A-\bar{\Pi}_A}] = 0 \tag{4.14a}$$

$$G^*{}_{Y_B} = G^*[\frac{\alpha\gamma}{Y_B+Y_A} + \frac{\beta(P-W^*+Y_BP'+X_BP')}{\Pi^*{}_B+\Pi_B-\bar{\Pi}_B} + \frac{(1-\alpha-\beta)(Y_A+X_A)p'}{\Pi^*{}_A+\Pi_A-\bar{\Pi}_A}]=0 \tag{4.14b}$$

$$G^*{}_{Y_A} = G^*[\frac{\alpha\gamma}{Y_B+Y_A} + \frac{\beta(Y_B+X_B)P'}{\Pi^*{}_B+\Pi_B-\bar{\Pi}_B} + \frac{(1-\alpha-\beta)(P-W^*+Y_AP'+X_AP')}{\Pi^*{}_A+\Pi_A-\bar{\Pi}_A}]=0 \tag{4.14c}$$

Again I take the symmetric solution, that is: $X_A = Y_B$, $X_B = Y_A$, and W = W*, which leads to $\Pi_A = \Pi^*{}_B$, $\Pi^*{}_A = \Pi_B$, $\bar{\Pi}_A = \bar{\Pi}^*{}_B$, $\bar{\Pi}_B = \bar{\Pi}^*{}_A$. Thus conditions (4.13a, b, c) and (4.14a, b, c) can be combined as:

$$\frac{\alpha\theta}{W-\bar{W}}-\frac{\beta X_A}{\Pi_A+\Pi_B-\bar{\Pi}_B}-\frac{(1-\alpha-\beta)X_B}{\Pi_B+\Pi_A-\bar{\Pi}_A}=0 \tag{4.15}$$

$$\frac{\alpha\gamma}{X_A+X_B}+\frac{\beta(P-W+X_AP'+Y_AP')}{\Pi_A+\Pi_B-\bar{\Pi}_B}+\frac{(1-\alpha-\beta)(X_B+Y_B)P'}{\Pi_B+\Pi_A-\bar{\Pi}_A}=0 \tag{4.16}$$

$$\frac{\alpha\gamma}{X_A+X_B}+\frac{\beta(X_A+Y_A)P'}{\Pi_A+\Pi_B-\bar{\Pi}_B}+\frac{(1-\alpha-\beta)(P-W+X_BP'+Y_BP')}{\Pi_B+\Pi_A-\bar{\Pi}_A}=0 \tag{4.17}$$

Combining equations (4.16) and (4.17) yields:

$$\Pi_B+\Pi_A-\bar{\Pi}_A=\frac{(1-\alpha-\beta)}{\beta}(\Pi_A+\Pi_B-\bar{\Pi}_B) \tag{4.18}$$

Substituting (4.18) into (4.15) yields

$$\frac{\alpha\theta}{W-\bar{W}}-\frac{\beta(X_A+X_B)}{\Pi_A+\Pi_B-\bar{\Pi}_B}=0 \tag{4.19}$$

Substituting (4.18) into either (4.16) or (4.17) yields

$$\frac{\alpha\gamma}{X_A+X_B}-\frac{\beta[W-P-(X+Y)P']}{\Pi_A+\Pi_B-\bar{\Pi}_B}=0 \tag{4.20}$$

From (4.19) and (4.20) yields

$$\frac{\gamma}{\theta}(W-\bar{W})=W-P-(X+Y)P' \tag{4.21}$$

I call the curve associated with equation (4.21) "the CC curve". The CC curve is like a contract curve between the three players: two firms and one union. It shows the efficient locus of the bargained wage rates and employment for each country and the world. As shown in figures 4.3 and 4.4, the CC curve starts at the intersection point between marginal revenue curve and the competitive wage curve. It is positively sloped when the union is employment oriented and negatively sloped when the union is wage oriented.

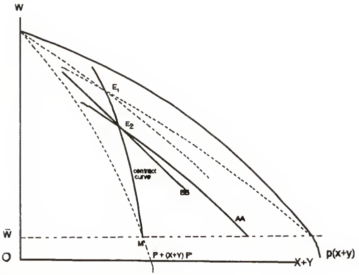

Figure 4.3: Wage Oriented Union

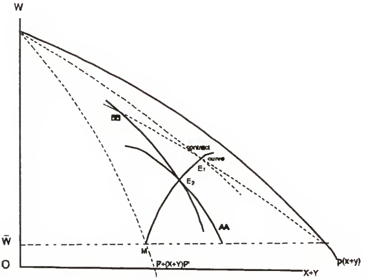

Figure 4.4: Employment Oriented Union

To solve the above systems, let $X_A = hX$, then $X_B = (1-h)X$, where $h = X_A/(X_A+X_B)$. By rearranging algebra, I obtain

$$W = g(2P-\bar{P}) + (1-g)\bar{W} \tag{4.22}$$

$$W = k(2P-\bar{P}) + (1-k)(P+(X+Y)P') \tag{4.23}$$

where $g = \frac{\alpha\theta}{\alpha\theta+1-\alpha}$, $k = \frac{\alpha\gamma}{\alpha\gamma+1-\alpha}$, and $\bar{P} = \bar{P}(X)$. $2P-\bar{P} > 0$ *if* $W-(1-g)\bar{W} > 0$, which is apparently true. Equation (4.22) is the new AA curve and (4.23) is the new BB curve under cross-hauling DFI.

Now let me compare the old and new AA and BB curves, namely equation (4.22) with equation (4.4) and equation (4.23) with equation (4.5). Since $P < \bar{P}$, then $2P - \bar{P} < P$. Thus the negotiated wage rate in (4.22) and (4.23) are lower than that in (4.4) and (4.5) for every level of employment. Differentiation of the above equations show that the new AA and BB curves are steeper than the old AA and BB curves, but they lie everywhere below the old AA and BB curves because of the lower negotiated wage rate. Thus under cross-hauling DFI, both the AA and BB curves shift downward.

Figures 4.3 and 4.4 plot the new AA and BB curves and the CC curve. The intersection of the new AA and BB curves is on the CC curve, which determines the equilibrium levels of wages and employment under cross-hauling DFI. Because of the downward shifts of both the AA and BB curves, the Nash equilibrium under cross-hauling DFI moves closer to the monopoly firm and competitive labor outcome.

If the union is wage oriented ($\theta>\gamma$), both the initial contract curve (without DFI) and the CC curve are negatively sloped. But under cross-hauling DFI, the equilibrium lies below and to the right of the initial equilibrium without DFI. Hence, the negotiated wage rate decreases and the level of employment increases with cross-hauling DFI. This change comes from the fact that when firms do not undertake cross-hauling DFI and the union is wage oriented, the negotiated wage rate tends to be too high and the level of employment tends to be too low. Cross-hauling DFI raises the MNF's conflict payoff above zero and hence increases its bargaining position and relatively decreases the union's bargaining position. Consequently the negotiated wage rate decreases and the level of employment increases.

If the union is employment oriented ($\gamma > \theta$), both the initial contract curve and the CC curve are positively sloped. With cross-hauling DFI, the equilibrium lies below and to the left of the initial equilibrium without DFI. Hence, both the negotiated wage rate and the level of employment decrease. This change comes from the fact when firms do not undertake cross-hauling DFI and the union is employment oriented, both the wage rate and the equilibrium level of employment are too high. Cross-hauling DFI thus reduces both of them.

If the union is equally concerned about excess wages and employment ($\theta = \gamma$), both the initial contract curve and the CC curve are vertical and are identical (curves are not drawn for the purpose of clarity). Hence the negotiated wage rate decreases and the level of employment stays the same. This change comes from the fact that with a neutral union and without DFI, the negotiated wage rate is above the competitive wage level. Cross-hauling DFI thus decreases the negotiated wage rate.

The following proposition summarizes the above results, which come directly from the change of relative bargaining positions for the union and the MNF. Under cross-hauling DFI, the MNF's conflict payoff increases above zero while the union's conflict payoff stays at zero. This puts the union in a more conservative position while the MNF in a more aggressive one.

Proposition 4.1: when firms undertake cross-hauling DFI, the negotiated wage rates in both countries decrease; the equilibrium level of employment increases (decreases) if the union is wage (employment) oriented. As a consequence, cross-hauling DFI moves the Nash bargaining equilibrium closer to the monopoly firm and competitive labor outcome.

4.2.3.2 The first stage: cross-hauling DFI

After the wage rate and the level of employment are determined through simultaneous Efficient Nash bargains in the second stage, I can substitute the negotiated wage rate and the level of employment back to find out the firms' profits and firms can decide whether to undertake cross-hauling DFI or not in the first stage. The objective here is to see under what conditions the new equilibrium profits are higher than the old profits and hence firms will in fact undertake cross-hauling DFI.

Notice that due to symmetry, profits are equal for the two firms. Here I only consider firm A. With cross-hauling DFI, firm A's profit is the sum of the profits from its two branches (the US and Europe), subtracted by the sunk cost F in the first stage.

$$\begin{aligned} \Pi_{II} &= \Pi_A + \Pi^*_A - F \\ &= (1-g)(P(X_{II}) - \bar{W})X_{II} + g(\bar{P} - P(X_{II}))X_{II} - F \end{aligned} \tag{4.24}$$

where the subscript $_{II}$ denotes 'with cross-hauling DFI' for respective variables.

Subtracting the old profit in (4.6) from the new one in (4.24), I obtain the profit differentials (potential gain or loss) when firms undertake cross-hauling DFI:

$$\Delta\Pi = \Pi_{II} - \Pi_{O} = (1-g)[(P_{II} - \bar{W})X_{II} - (P - \bar{W})X] + g(\bar{P} - P_{II})X_{II} - F \qquad (4.25)$$

where $\Pi_O = (1-g)(P-\bar{W})X$.

Proposition 4.2: when F = 0, then $\Delta\Pi > 0$.

Proof: when F = 0, $\Delta\Pi = (1-g)[(P_{II} - \bar{W})X_{II} - (P - \bar{W})X] + g(\bar{P} - P_{II})X_{II}$.

For $\theta > \gamma$, since $X^{II} > X$, hence $P + XP' - \bar{W} > 0$ is a sufficient condition for $\Delta\Pi > 0$. But the marginal revenue is always above the competitive wage with efficient Nash bargaining (see figure 4.1a), hence $P + XP' - \bar{W} > 0$ always holds for $\gamma < \theta$;

For $\gamma > \theta$, since $X^{II} < X$, thus $P + XP' - \bar{W} < 0$ is a sufficient condition for $\Delta\Pi > 0$. But the marginal revenue is always below the competitive wage with efficient Nash bargaining (see figure 4.1a), hence $P + XP' - \bar{W} < 0$ always holds for $\gamma > \theta$. (Q.E.D.)

Proposition 4.2 provides conditions under which cross-hauling DFI occurs when firms do not incur sunk costs. When F = 0, profits always increase if firms undertake cross-hauling DFI, regardless of the unions' preferences.

Proposition 4.3: when F > 0, $\Delta\Pi > 0$ *if* $F < (P + XP' - \bar{W})(X_{II} - X) + g(\bar{P} - P_{II})X_{II}$.

Proof: straightforward from proposition 4.2.

Proposition 4.3 provides conditions under which cross-hauling DFI occurs when firms incur sunk costs. When $F > (P + XP' - \bar{W})(X^{\iota} - X) + g(\bar{P} - P_{II})X_{II}$, the sunk cost more than offsets the gains from improved bargaining positions for the firms. As a result, the firms' profits will decrease if they undertake DFI. Thus when the sunk cost is big enough, cross-hauling DFI does not occur.

4.3 The Asymmetric Case: One Way DFI

The previous section has shown that with cross-hauling DFI, the negotiated wage rates in both countries are reduced and both MNFs' profits are increased if the sunk cost for DFI is not too large. In this section, I introduce asymmetry into the model by assuming that only firm A undertakes DFI in Europe, while firm B does not invest in the US. The results I obtain are interesting: a). the negotiated wage rates in both countries decrease for every level of employment and firm B becomes a free rider in DFI; b). firm B's profit decreases to below the level when neither firm undertakes DFI.

When firm A invests in Europe and firm B does not invest in the US, then in the US the negotiated wage rate and the level of employment are negotiated between the US labor union and firm A, while in Europe they are determined through bargaining among the European labor union, firm A and firm B. Again I assume that firm A incurs a sunk cost F in the first stage when producing in Europe. In the second stage, if bargaining breaks down in one country, firm A still produces in the other country, while firm B does not. Thus the conflict payoff is positive for firm A, while the conflict payoffs for firm B and the unions stay at zero, since firm B does not have a subsidiary and labor unions are nationally independent.

The generalized Nash product for the US bargaining game can be written as:

$$G(X,W) = U^{\alpha}(\Pi_A + \Pi^*_A - \bar{\Pi}^*_A)^{1-\alpha} \tag{4.26}$$

where $U = (W-\bar{W})^{\theta}X^{\gamma}$ is the union utility function in the US, $\Pi_A = (P-W)X$ is the profit function for firm A's US branch and $\Pi^*_A = (P-W^*)Y_A$ is the profit function for A's European branch with output Y_A. $\bar{\Pi}^*_A = (\bar{P}(Y)-W^*)Y_A$ is firm A's profit from the European branch when bargaining in the US breaks down, hence it is A's conflict payoff for the US bargaining game.

Similarly, the generalized Nash product for the European game can be written as:

$$G^*(Y_A,Y_B,W^*) = U^{*\alpha}\,\Pi^{*\,\beta}_B\,(\Pi^*_A+\Pi_A-\bar{\Pi}_A)^{1-\alpha-\beta} \tag{4.27}$$

where $U^* = (W^*-\bar{W})^{\theta}(Y_A+Y_B)^{\gamma}$ is the union utility function in Europe, $\Pi^*_B = (P-W^*)Y_B$ is firm B's profit function in Europe with output Y_B, Π_A, Π^*_A are as specified in the US game and α, β are relative bargaining powers. $\bar{\Pi}_A = (\bar{P}(X)-W)X$ is firm A's US branch profit when bargaining in Europe breaks down, hence it represents A's conflict payoff for the European game. Please observe that with asymmetry in DFI, the wage rates W and W*, and the levels of employment X and Y are not necessarily equal in the two countries.

Again I assume the two bargaining games to be simultaneous and solve them simultaneously. In the US game, the players choose W and X to maximize the generalized Nash product. The first order conditions can be written as:

$$W = gP + (1-g)\bar{W} - \frac{g(\bar{P}-P)Y_A}{X} \tag{4.28a}$$

$$W = kP + (1-k)[P + (X+Y_A)P'] - \frac{k(\bar{P}-P)Y_A}{X} \tag{4.28b}$$

where $g = \dfrac{\alpha\theta}{\alpha\theta + 1 - \alpha}$, $k = \dfrac{\alpha\gamma}{\alpha\gamma + 1 - \alpha}$.

Equations (4.28a) and (4.28b) correspond respectively to the AA and BB curve equations for the US bargaining game. By comparing them with equations (4.4) and (4.5), one sees that when firm A undertakes DFI, the negotiated wage rate in the US is lower than without DFI at all for every level of employment.

In the European game, the three players choose W*, Y_A, and Y_B to maximize the generalized Nash product. The first order conditions can be written as:

$$W^* = gP + (1-g)\bar{W} - \frac{g(\bar{P}-P)X}{Y} \tag{4.29a}$$

$$W^* = kP + (1-k)[P + (X+Y)P'] - \frac{k(\bar{P}-P)X}{Y} \tag{4.29b}$$

Equations (4.29a) and (4.29b) correspond respectively to the AA and BB curve equations for the European game. By comparing them again with equations (4.4) and (4.5), we see that the negotiated wage rate in Europe decreases for every level of employment when firm A undertakes DFI in Europe. Even though firm B does not undertake DFI, it benefits from the lower negotiated wage rate and becomes a free rider in DFI.

Next, I turn to the profit levels. Under asymmetry of DFI, firm B's profit is

$$\begin{aligned} \Pi_N &= \Pi^*{}_B = (P-W^*)Y_B \\ &= \frac{\beta}{1-\alpha}(1-g)(P-\bar{W})Y - \frac{\beta}{1-\alpha}(1-g)(\bar{P}-P)X \end{aligned} \tag{4.30}$$

where β is firm B's relative bargaining power, $1-\alpha$ is the sum of the relative bargaining powers of A's European branch and firm B and the subscript $_N$ denotes 'without DFI under asymmetry'.

By comparing expression (4.30) with expression (4.6), which is the firm profit under no DFI by either firm, one sees that firm B's profit strictly decreases when it does not undertake DFI while firm A does. Thus I establish a situation where on the one hand firm B is a free rider in receiving a lower wage rate without undertaking DFI and incurring the sunk cost, and where on the other hand its profit decreases. The reason is that in the European bargaining game, the three players choose W*, Y_A and Y_B to maximize the generalized Nash product. When firm A becomes a multinational, it raises the reservation profits for the whole firm (both branches). Thus in the European game, firm A becomes more aggressive, while the union and firm B become more conservative. As a consequence, the union yields to the two firms in terms of the negotiated wage rate, while firm B yields to firm A's European branch in terms of output.

Firm A's profit includes the profits from its US and European branches minus the sunk cost F:

$$\begin{aligned}\Pi_I &= \Pi_A + \Pi^*_A - F \\ &= (1-g)(P-\bar{W})X + \frac{1-\alpha-\beta}{1-\alpha}(1-g)(P-\bar{W})Y \\ &\quad + \frac{\beta}{1-\alpha}(1-g)(\bar{P}-P)X + g(\bar{P}-P)(X+Y_A) - F\end{aligned} \tag{4.31}$$

where the subscript $_I$ denotes 'with one way DFI'.

Apparently the level of profit in (4.31) is higher than that in (4.6) or (4.24), i.e. without DFI or with cross-hauling DFI, for given levels of X and F. Hence firm A benefits the most from DFI when it is the only MNF in the presence of unionized markets.

The following proposition summarizes the most interesting results of this section.

Proposition 4.4: With one way DFI, the negotiated wage rates in both countries decrease for every level of employment; the profit for the investing firm increases to a level above cross-hauling DFI profit; the free-rider firm's profit decreases to below the level when neither firm undertakes DFI.

4.4 Nash Equilibrium and Welfare Implications of Cross-hauling DFI

This section has two objectives: I show that cross-hauling DFI is the unique Nash equilibrium when the sunk cost is small enough and I study the welfare implications of cross-hauling DFI.

In the previous sections, I have analyzed several equilibria of DFI in the presence of unionized markets: a). the case of no DFI by either firm, b). cross-hauling DFI, c). one way DFI (two equilibria). They can be summarized in the following matrix, which represents a two-person, simultaneous move-game with two strategies for each player.

	Not Invest	Invest
Not Invest	Π_O, Π_O	Π_N, Π_I
Invest	Π_I, Π_N	Π_{II}, Π_{II}

In the above game, one can treat firm A as the row player and firm B as the column player. $\Pi_O, \Pi_I, \Pi_N, \Pi_{II}$ denote payoffs and are given respectively by conditions (4.6), (4.31), (4.30) and (4.24). From the analysis of the previous sections, when the sunk cost F is small such that $F<(P+XP'-\bar{W})(X^{i}-X)+g(\bar{P}-P_{II})X_{II}$, we can rank the payoffs such that $\Pi_I > \Pi_{II} > \Pi_O > \Pi_N$. The Nash equilibrium in this game is unique and it is DFI by both firms. Thus with identical technologies in both countries, cross-hauling DFI dominates any other equilibria and the payoff to each firm is Π_{II} .

Proposition 4.3 implies that if the sunk cost of DFI for each firm is large such that $F>(P+XP'-\bar{W})(X^{i}-X)+g(\bar{P}-P_{II})X_{II}$, then Π_{II} decreases to below Π_O , neither firm invests becomes the Nash equilibrium, the payoff to each firm is Π_O .

The case of one way DFI can also be a Nash equilibrium provided that the two firms have different sunk costs of DFI and that the difference is big enough such that $\Pi_I > \Pi_O$ holds for the lower cost firm while $\Pi_I < \Pi_N$ holds for the higher cost firm. In equilibrium, the lower sunk cost firm undertakes DFI and receives Π_I as payoff while the other firm does not and receives Π_N .

Now I turn to the welfare implications of cross-hauling DFI. Let $\Phi(X+Y)$ be world welfare, V(X+Y) be the utility of consuming output X+Y, where V'(X+Y) = P(X+Y). Then under cross-hauling DFI, world welfare can be written as

$$
\begin{aligned}
\Phi(X+Y) &= V(X+Y) - PX - PY && \text{consumer surplus} \\
&\quad + (P-W)(X+Y) - 2F && \text{producer surplus} \\
&\quad + (W-\bar{W})(X+Y) && \text{union rents} \\
&= V(X+Y) - \bar{W}(X+Y) - 2F && (4.32)
\end{aligned}
$$

When X = Y, condition (4.32) becomes

$$\Phi(X) = V(X) - \bar{W}X - F \tag{4.33}$$

Condition (4.33) represents the total welfare of one country under cross-hauling DFI.

Differentiating (4.33) with respect to X yields

$$\frac{d\Phi}{dX} = P - \bar{W} > 0 \tag{4.34}$$

Condition (4.34) states that more output (employment) increases national welfare with cross-hauling DFI. Since output increases if the union is wage oriented, and decreases if the union is employment oriented, thus cross-hauling DFI will decrease the country's welfare when the union is employment oriented and increase welfare when the union is wage oriented.

The following proposition summarizes the results of this section.

Proposition 4.5: (i). cross-hauling DFI is the unique Nash equilibrium if the sunk cost of DFI is sufficiently small; no DFI occurs if the sunk cost is sufficiently large; if the two firms have significantly different sunk costs, then one way DFI occurs; (ii). cross-hauling DFI increases national welfare if the union is wage oriented, decreases national welfare if the union is employment oriented.

4.5 Conclusions and Extensions

The conflict between MNFs and labor groups is hardly news in today's world. The simple model proposed in this chapter is designed to capture two features of the modern economy. First, I model endogenously the increasing tendency of DFI--mutual penetration of DFI within a sector in different countries. Second, I want to highlight how the labor market affects cross-hauling DFI. Using simultaneous efficient Nash bargaining processes between the MNFs and the national unions, I showed that when firms undertake cross-hauling DFI, the negotiated wage rate is reduced for every level of output, the level of employment is decreased or increased depending on whether the union is employment oriented or wage oriented. I identified conditions under which cross-hauling DFI occurs and analyzed the welfare implications of cross-hauling DFI. With identical technologies across countries and if the sunk cost for DFI is sufficiently small, then cross-hauling DFI is the unique Nash equilibrium.

The achievement of this chapter is that the results are derived in the context of an explicit bargaining between labor and management, which hopefully enables better focus on empirically more relevant issues. For example, some of the most common forms of transnational bargaining,[7] e.g., sympathy strikes, financial assistance and refusal to work overtime on the part of the union, can be captured by this model, since transnational bargaining basically involves relatively enhancing the labor unions' bargaining positions.

I should point out that this analysis only focuses on one of the factors which affect the pattern of cross-hauling DFI. Other factors, e.g., trade costs and commercial policy, can also be import in determining the pattern of DFI. Collusion of the two branches in one country's bargaining game against labor can also lower negotiated wage rates and induce cross-hauling DFI. I also abstract from competition in similar products. As Bhagwati (1982) pointed out, when competition intensifies, the result may well be intra-industry mutual penetration by MNFs through cross-hauling DFI. The nice property of multiplicity in propositions 4.1, 4.2 and 4.3 also suggests that the present model can be extended into a general equilibrium framework. Some of the above interesting issues will be studied in Zhao (1993).

Notes

1. See, for example, AFL-CIO (1987); 'Don't Blame U.S. Uncompetitiveness on Wages', The Wall Street Journal, 29 November 1989 and 'Tough Vote--Threat of Cheap Labor Abroad Complicates Decisions to Unionize', The Wall Street Journal, 28 July 1992.

2. The best example is the vice presidential debate held on October 12, 1992, during which Al Gore asked Dan Quayle:" Dan, when are you and Gorge Bush going to stop moving our jobs to foreign countries?"

3. In the Heckscher-Ohlin model, capital is free to move between sectors. The influx of foreign capital will leave wages and rentals unchanged and drive the economy to specialize in its capital intensive goods.

4. Johnson explains this phenomenon by interpreting DFI as a pure transfer of technological know-how. If DFI occurs in capital intensive industries, it will raise real rentals and lower real wages.

5. The convenience of the Stone-Geary utility function is its multiplicative property, which allows explicit solutions in many cases.

6. I do not model trade explicitly in this paper. Whether a country imports or exports this homogeneous product depends on the size of the country and country-specific demand. But output is determined by the bargaining between labor and firms.

7. In an earlier paper (Zhao 1992), I discussed the issue of transnational bargaining.

CHAPTER 5
CONCLUSIONS

There are two most common types of DFI: horizontal extension of a firm's activities (producing the same goods elsewhere that are produced at home) and vertical integration backwards (production of raw materials). DFI among developed countries tends to be predominantly of the former type, while the latter type is most prevalent in LDCs. Moreover, horizontal DFI has become the most important form in the past several decades. Since the motivation for vertical DFI seems to be relatively self-evident, the focus of the dissertation has been on horizontal DFI.

The traditional approaches to DFI, as described in chapter 2, seem intuitively appealing, but only in perfect competitive markets. However, different barriers to entry, nationalistic feelings, the phenomenon of cross-hauling DFI, etc., suggest that capital markets are imperfect.

This dissertation has analyzed two of the important elements that cause the capital markets to be imperfect: political economy and labor unions. Because of the interactions of political economy and labor unions, the resulting barriers cause a portion of commodity trade to be replaced by DFI and a portion of DFI to be replaced by JVs; while cross-hauling DFI arises because of firm rivalry and the interactions of labor and management.

Studies on quid pro quo DFI and quid pro quo JV are still at the early stages. Very little empirical research has be conducted. Yet there are some casual evidences: the Toyota-GM JV and the examples quoted from Harrigan (1985) in the introduction of chapter 3. It has also been observed that the Japanese government consciously used DFI and JVs to influence U.S. policy making (see Bhagwati, 1991, pp160-163). The models in chapters 2 and 3 would predict that industries with relatively strong unions and weak firms tend to have more inward DFI; industries with both strong firms and unions tend to have more JVs; if the investing country does not consciously take advantage of quid pro quo DFI, then JV is not formed. I believe these are testable hypotheses.

Previous studies (mostly general equilibrium models) generate cross-hauling DFI in different industries, not in the same industry. Chapter 4 generated intra-industry cross-hauling DFI as a result of the interactions of labor unions and oligopolistic firms. The model would predict that union wages are lower in industries with more intra-industry DFI than without. It is safe to infer that cross-hauling DFI occurs more often in countries that are similar, which is consistent with empirical evidence. This is in contrast to Helpman (1984) and Jones et al. (1983), which predicted that the bigger the difference between two countries, the greater the chance for cross-hauling DFI.

APPENDIX A
COMPARATIVE STATICS

All subscripts (except '$_o$') will denote partial derivatives.

Totally differentiating FOC (3.6a) or (3.6b) yields

$$U_{LL}\,dL^{u} = -Y_{XZ}X_{L}\,dZ \tag{A1}$$

which implies $dL^{u}/dZ < 0$, because $Y_{XZ} > 0$ from condition (3.4), provided that the third derivative, P''', is close to zero, and $U_{LL} = Y_{XX}(X_L)^2 + Y_X X_{LL} - V''$ is negative by concavity of the union's utility function.

Totally differentiating FOC (3.8a) yields

$$\Pi_{LL}\,dL^{f} = -X_L[YP''(1+Y_Z)+P'Y_Z]dZ \tag{A2}$$

which implies $dL^{f}/dZ < 0$, because the coefficient of Dz is positive, and $\Pi_{LL} = (P'Y_X+YP''+YP''Y_X)(X_L)^2 + YP'X_{LL} - C''$ is negative by concavity of the home firm's profit function.

Totally differentiating FOC (3.8b) yields

$$\Pi_{LL}\,dL^{f} = -X_L[(s+Y_Z)P' + (1+Y_Z)(Y+sZ)P'']\,dZ - X_L[(Z+Y_s)P' + (Y+sZ)P''Y_s]\,ds \tag{A3}$$

which implies $dL^{f}/dZ < 0$ and $dL^{f}/ds > 0$, because the coefficient of ds is negative, while that of dZ is positive.

Totally differentiating FOC (3.18a) yields

$$U_{LL}\,dL^{u} = -Y_{XZ}X_{L}dZ - Y_{X}X_{LZ_{o}}dZ_{o} \tag{A4}$$

where Y is a function of Z, but not of Z_0 directly; X is not affected by Z, but by Z_0 directly. Condition (3.18a) implies $dL^{u}/dZ_{o} < 0$.

Totally differentiating FOC (3.18b) yields

$$\begin{aligned}\Pi_{LL}\,dL^{f} = {} & \\ & -X_{L}[(s+Y_{Z})P' + (1+Y_{Z})(Y+sZ)P'']dZ \;-\; X_{L}[(Z+Y_{s})P' + (Y+sZ)P''Y_{s}]ds \\ & -\{(Y+sZ)P'\frac{\partial X_{L}}{\partial s\Pi^{Z}{}_{o}} + X_{L}\frac{\partial X}{\partial s\Pi^{Z}{}_{o}}[P'Y_{X}+(Y+sZ)(1+Y_{X})P'']\}\frac{\partial s\Pi^{Z}{}_{o}}{\partial Z_{o}}d_{Z_{o}} \\ & -\{(Y+sZ)P'\frac{\partial X_{L}}{\partial s\Pi^{Z}{}_{o}} + X_{L}\frac{\partial X}{\partial s\Pi^{Z}{}_{o}}[P'Y_{X}+(Y+sZ)(1+Y_{X})P'']\}\frac{\partial s\Pi^{Z}{}_{o}}{\partial s}ds_{o}\end{aligned} \tag{A5}$$

which implies $dL^{f}/dZ < 0$, $dL^{f}/ds > 0$ and $dL^{f}/dZ_{o} < 0$, $dL^{f}/ds_{o} < 0$.

APPENDIX B
CONDITIONS FOR TOTAL MARKET PROFITS TO INCREASE

This appendix proves that under certain conditions, the total profits of the foreign firm and the home firm increase by forming a JV. When the JV is formed, the foreign firm produces up to the VER in country Foreign. Thus the JV replaces part of the home firm's output. If the JV profit is bigger than the loss of the home firm's profit, then the total profits of the two firms increase.

The change of total profits consist of three components: the changes in total revenue and total cost and the sunk cost. Hence

$$\Delta(\Pi^{*}+\Pi) = \Delta R - \Delta C - F \tag{B1}$$

Since the JV uses the better technology of the foreign firm, production cost decreases and $\Delta C = -(\delta - 1)(R+W)Z,$ where Z is the output of the JV.

Whether the total profits increase depends on what ΔR is. As long as the reduction in production cost outweighs the sunk cost and the decrease in total revenue, then total profits increase. I assume this condition holds for the formation of the JV. This can be seen from the following four cases.

1). If the inverse demand function is a hyperbola, regardless of output changes,

$\Delta R = 0.$ Thus if the reduction in production cost outweighs the sunk cost, total profits increase.

2). If total output stays unchanged, then $\Delta R = 0.$ This is the same as case 1).

3). If total output increases, total revenue increases (decreases) if the inverse demand function has a price elasticity of demand greater (smaller) than one.

4). If total output decreases, total revenue increases (decreases) if the inverse demand function has a price elasticity of demand smaller (greater) than one.

Q.E.D.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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